JAN 10 1952
FORESTRY
LIBRARY

WORLD CROPS

THEIR CULTIVATION, PROTECTION, STORAGE, HANDLING AND PROCESSING FOR FOOD, FODDER, AND INDUSTRIAL PRODUCTS

VOLUME 4, No. 1 JANUARY 1952

A Publication of The Leonard Hill Technical Group

MONSANTO CHEMICALS FOR EVERY INDUSTRY

To formulators of

INSECTICIDES, WEED-KILLERS, FUNGICIDES

A new range of agricultural chemicals by Monsanto

	Diethyl paranitro-phenyl-thiophosphate	Organic phosphorus insecticide	When formulated, controls aphides, mites, grasshoppers, scale and thrips. Compatible with other insecticides and fungicides.
	2.4-Dichlorophenoxy-acetic acid Sodium 2.4-Dichlorophenoxy-acetate-monohydrate	Hormone-type herbicide	Toxic to non-grassy plants. Used for weed control in grassland, turf and cereals.
	Sodium pentachloro-phenate	Contact herbicide, water soluble	For control of broad-leaved weeds.
	Pentachlorophenol	Formulated as an oil emulsion spray	Toxic to broad-leaved weeds and grasses.
	Diphenyl	For impregnation of fruit wrapping-paper.	

and a valuable list of chemicals for use as —

WETTING AGENTS		For fruit and vegetable washing, dairy cleaning, general farm cleaning. Formulation of wettable powders and insecticidal sprays.
WOOD PRESERVATIVES		To protect against bacteria or fungi. Applied by dipping, brush or spray.
SOIL STERILISERS		All grades, blended to customers' requirements for this purpose.
MASKING AGENT for insecticides		As a masking agent for kerosene and other insecticide spray oils.

WORLD CROPS

Editor: Sir Harold A. Tempany, C.M.G., C.B.E., D.SC., F.R.I.C.

VOL. 4 No. 1 JANUARY 1952

CONTENTS

EDITORIAL COMMENT:
The World Outlook for Food and Agriculture; Developments in the Sudan; Rubber Production in Malaya; Ammoniacal Liquor as a Fertiliser; Plant Protection Conventions; Brazilian Development; The Smithfield Show, 1951; Increased Consumer Food Prices 1

World Agricultural Production—1951 5

Industry's Contribution to Agricultural Research—No. 1: Plant Protection, Ltd., and Crop Protection—*E. Holmes*, M.SC., PH.D. 10

FAO Meets in Rome 13

The Gezira Scheme in the Anglo-Egyptian Sudan—Part I—*H. Ferguson*, B.SC., N.D.A., N.D.D. 15

Farm Machinery: 1951 Smithfield Show 19

Agricultural Research in the British Colonial Dependencies 22

Some Agricultural Problems of Pakistan—*S. J. Wright*, M.A. 23

New Books 27

Tobacco—The Current Situation 29

Coming Events 31

Research Developments 32

Reclaiming the New Forest—*David R. Browning*, N.D.A., N.D.D. 33

The Amos Memorial Lecture 37

Mechanising Nursery Work 38

Planned Development in the Northern Territories of Australia 39

Methane from Manure as Tractor Fuel 40

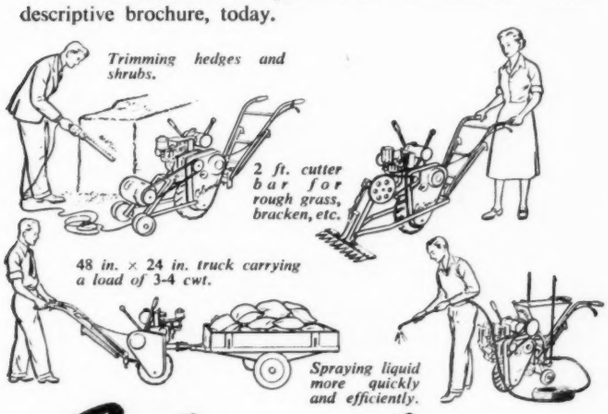
World Crop Reports 41

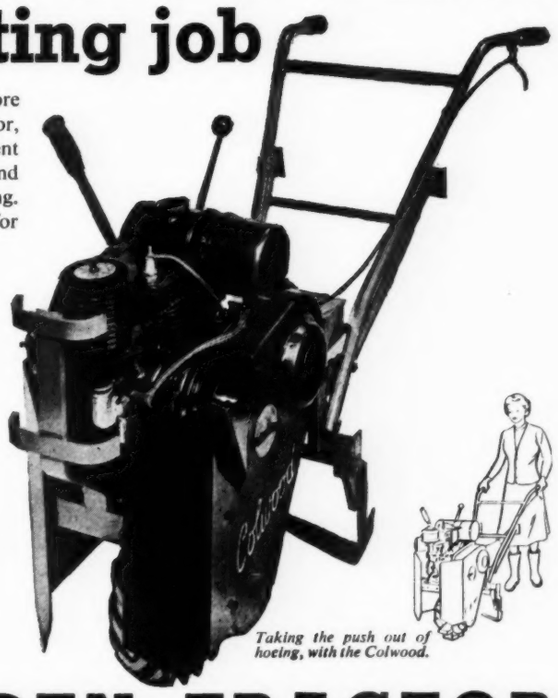
Published monthly by Leonard Hill Limited, 17 Stratford Place, London, W.1, England. (Tel. Mayfair 7383)
U.S.A. 17 East 48th Street, New York City. (PLaza 5-1127)

Subscription rates: *1 year 6 dollars, 3 years 12 dollars, paid in advance*

The finest single wheel tractor for every cultivating job

The Colwood Garden Tractor enables you to do so many jobs more quickly and efficiently. Designed primarily as a Hoe and Cultivator, a standard power take-off enables you to fit additional equipment for grass-cutting and mowing, spraying, dusting, seed sowing and broadcasting, fertilizer spreading, hedge trimming and pumping. It is economical and requires little maintenance. Write for descriptive brochure, today.


Trimming hedges and shrubs.
2 ft. cutter bar for rough grass, bracken, etc.
48 in. × 24 in. truck carrying a load of 3-4 cwt.
Spraying liquid more quickly and efficiently.



Taking the push out of hoeing, with the Colwood.

Colwood GARDEN TRACTOR

DASHWOOD ENGINEERING LTD., EMPIRE WORKS, LONDON, S.E.20. 'Phone: SYDenham 5161

Serving Agriculture
SINCE 1880

SINCE 1880 GALLENKAMP HAVE SUPPLIED LABORATORY EQUIPMENT AND SCIENTIFIC APPARATUS FOR AGRICULTURAL RESEARCH THROUGHOUT THE WORLD. THE WORLD-WIDE EXPERIENCE BEHIND THE NAME GALLENKAMP IS AT YOUR SERVICE

WE INVITE YOU TO SEND
FOR FURTHER PARTICULARS

GALLENKAMP
SPECIALITIES INCLUDE

- ★ Centrifuges
- ★ Furnaces
- ★ Ovens
- ★ Standard Joint Glassware
- ★ Sintered Filtration Apparatus
- ★ Volumetric Glassware
- ★ Incubators
- ★ Water-baths
- ★ Stirrers

Gallenkamp
REGD.

17-29 SUN STREET
LONDON EC2 · ENGLAND

A · GALLENKAMP & CO · LTD

Editorial Comment

The world outlook for food and agriculture

BY the time this issue of WORLD CROPS appears the sixth session of the conference of FAO will be a thing of the past. It was the first session to be held in the new premises of the organisation in Rome and, from the agenda, it was plain that the session would prove one of the most momentous so far held, for not only was the world situation in regard to agricultural production to be considered but the whole organisation of FAO was to be reviewed.

On another page we include a summary of the first meeting of the conference. As a prelude to it there was prepared a series of documents, including the annual review of the state of food and agriculture which has been compiled each year by FAO authorities. A summary of some of the main findings of this document appears on another page of this issue and provides an outline of the position in the various world regions.

The outlook can only be described as far from reassuring. The indications are that in most parts of the world food production is not keeping pace with population growth, and indeed the production of most of the agricultural staples per head of population is still below pre-war levels and is likely to remain so for the next two or three years in all parts of the world except North America and Oceania. The perturbing character of these conclusions is emphasised when it is remembered that the report of the League of Nations Mixed Commission on nutrition, published in 1937, pointed out that, even at that date, the nutritional standards of the majority of people all over the world were seriously deficient.

The most important area and the most urgent problem is undoubtedly in the Far East, with a total population of some 1,200 million, which is increasing at the rate of approximately 12 millions per annum, and a level of production hovering between minimum basic needs and famine. Africa is a special case, since, although cultural standards are lower than elsewhere, the majority of dependent territories have probably better facilities for access to capital and technical skills than many self-governing countries. Difficult problems exist in the Middle East and in Latin America ; both possess large possibilities for expansion and improvement of agricultural production, but to enable expansion to exceed population growth, considerable intensification of existing efforts will be needed

In North America, Oceania and, to a lesser degree, Europe the position is different ; educated farming communities, a vast accumulation of technical knowledge and the existence of well-organised agricultural services are a tremendous asset and, provided marketing, exchange and price difficulties can be overcome, farmers should be able to expand production over the ensuing years with the minimum of outside help.

A supplementary statement recently issued by FAO brings the information slightly more up to date, but does not modify the general conclusion to be drawn. It appears to be definitely established that total food production will be somewhat greater than in 1950, while economic conditions point to a further expansion in the demand for agricultural products and a further aggravation of the dollar exchange position.

The increase in armaments is an over-riding factor in the position. If the defence effort could be so organised as to take into account the need for expansion of agricultural production, particularly in the food-deficient areas, the immediate outlook could be improved. At present, however, it is at least doubtful whether the interdependence of the two is everywhere fully recognised, or that, as Mr. Charles Brannan remarked, improvements in agriculture and food production are in fact a part of the defence effort, is universally understood.

Let us hope that the findings and recommendations of the conference will receive the attention in high places which they deserve and not be accorded merely the lip service which at times they have received in the past.

Developments in the Sudan

THE recent unilateral denunciation by the Egyptian Government of the 1899 agreement and the 1936 treaty whereby the condominium over the Sudan was established, as well as the events in the Suez Canal Zone, draws attention to conditions in that country. We have in these columns referred on many occasions to agricultural conditions in the Sudan and the first of a series of articles by Mr. H. Ferguson on the Sudan Gezira, which appears on another page, is timely since it provides a concise account of what must certainly be reckoned one of the major British agricultural achievements of the last half century.

Public memory is proverbially short and in the welter and clamour of insurgent nationalist aspirations and the clash of conflicting political ideologies which threaten the peace and wellbeing of the human race, too often scant attention is paid to the events of the past and the lessons which they teach.

It is as well to remember that prior to the Sudan Campaign of 1897 Egyptian rule in the Sudan had completely broken down, and the country had been

left in a state of anarchy. From this it has been rescued by the constructive policy pursued since the establishment of the condominium.

The Gezira scheme is indeed a first class example of constructive and continuous development on planned lines, based upon sound scientific experiment and continued uninterruptedly. The results have been striking; an economy has been built up which has enabled a high state of prosperity to be established on the basis of controlled peasant agriculture. It remains today an outstanding achievement which can provide a pattern for similar developments in under-developed regions and as such is worthy of the closest study.

We commend Mr. Ferguson's articles to the careful attention of all who are interested in the question of the improvement of peasant agriculture which by all standards must be considered as one of the greatest and perhaps the greatest agricultural problem with which the world is confronted.

Rubber production in Malaya

THE dependence of the British economy on rubber exports from Malaya is well known, and the handbook of Malayan rubber statistics for 1950 recently issued by the Malayan Government provides much information about rubber production and enables certain aspects of the position to be assessed.

It appears that the total production of rubber in Malaya in 1950 was 694,090 tons, of which 376,756 tons were produced on estates of over 100 acres and 317,345 on smallholdings of less than 100 acres. The total net exports for the same period amounted to 657,845 tons valued approximately at £216 million. Of this, between one-third and one-half went to dollar sources; the importance of rubber as a dollar earner is therefore obvious.

Total production has expanded greatly since the reoccupation of Malaya in 1945 after the Japanese invasion, which lasted from 1941 to 1945, and is nearly 150,000 tons higher than the pre-occupation maximum production of 547,202 tons in 1940. The gain is probably partly attributable to the prolonged rest which the majority of the trees had during the occupation period, but yields are showing little if any signs of diminishing with lapse of time —in 1950 production was only 4,000 tons less than in 1948 when the all-time record of 689,189 tons was obtained—and the effect of the replacement of low-yielding unselected seedling rubber by high-yielding clonal material is obviously being increasingly shown. These developments are almost entirely confined to estates. They commenced in the 1930s and by the time of the invasion somewhere between 300,000 and 400,000 acres had been so established. Fortunately the majority of these areas escaped damage during the occupation and although they were neglected their rehabilitation was immediately practicable.

Since then further planting has proceeded at the rate of roughly 50,000 acres a year and at the end of 1950 the total area in high yielding material amounted to 589,997 acres or 30% of the total planted acreage on estates of 1,976,810 acres. Of this 420,000 acres were of tappable age and 400,000 were actually tapped in 1950.

These developments on estates have taken place despite difficult conditions and the ever-increasing threat from banditry. They are unquestionable proof of the indomitable courage and enterprise of the estate planting body.

It has for long been emphasised that the rejuvenation of smallholdings is an equally pressing necessity; various steps have been suggested to bring this about but so far success has been small. Of the total smallholding area of 1,402,000 acres or 45% of the total planted area, only a small fraction has so far been replanted in high yielding material, despite efforts of the Malayan Government to encourage it.

Meantime Sir John Hay has recently introduced an element of cold reason into the discussion by pointing out that large-scale replanting schemes are premature while the 'emergency' remains unfinished. Indeed the latest reports in this regard are alarming to say the least of it. It is to be hoped that the visit of the Colonial Secretary, Mr. Oliver Lyttleton, to Malaya, may be productive of measures which will effectively restrain these communistic activities threatening an industry which is one of the greatest achievements in British-sponsored agricultural development in overseas territory, the maintenance of which is vital to the economy of the sterling area.

Ammoniacal liquor as a fertiliser

THE production of additional supplies of food is a major concern in most countries, and it is now widely recognised that higher crop yields demand more fertilisers.

Rising fertiliser costs, however, are causing farmers to look around for alternative sources, and this search might well be extended to technicians not immediately concerned with agriculture, for if there are sources of potential fertilising material available they should be used.

It is well known, for instance, that a secondary product of the coal gas industry is ammoniacal liquor. This has long been used for the manufacture of sulphate of ammonia. It is believed that millions of gallons of this liquor are available annually and the question has been raised whether, in view of the extreme present shortage of sulphur, means could not be devised of applying it direct to the soil as a fertiliser either in dilute or concentrated form, thereby reducing handling and eliminating the use of sulphuric acid.

Some gasworks in Britain are already interesting

themselves in this possibility and already some interesting results have been obtained. The spraying or pouring of the liquor is, of course, liable to be attended by some loss of gaseous ammonia, but this is influenced by the weather at the time of application, while there is also a certain amount of risk of damage to growing plants by scorching.

It appears that selecting the best time for application may have an important influence in minimising such losses. It also appears that losses may be reduced by drilling or injecting the liquor into the soil.

In Europe—especially Denmark—many farmers equip themselves with liquid manure drills as standard pieces of farm equipment, and such a tool might be usefully adapted for the application of ammoniacal liquor.

It would seem that there may be scope for further investigational work, while the possibility of combining its application as a fertiliser with that of serving as a vehicle for insecticides against soil-inhabiting insects might also be worth exploring.

Plant protection conventions

MANKIND has suffered enough in the past from pests and diseases of crops introduced from one country to another as the result of imports of plants, parts of plants, crop products and other materials without adequate precautions. In the more developed countries the dangers are fully recognised and legislation exists to provide protection, including inspection and quarantine of such material and the issue of phytosanitary certificates of freedom from disease to accompany consignments. Obviously this demands international co-operation, since if there is not sufficient uniformity in the legislative provision in force in different countries, arrangements are liable to break down. There must be control both at the exporting as well as the importing end, and the minimum interference with the course of international trade.

The dangers have been intensified with the great increase of air travel and transport of recent years, since the brief duration of air compared with ocean voyages greatly increases the risk of introduction of pests and diseases in a viable form.

The need for some international safeguarding arrangement in this regard has long been recognised and as long ago as 1924 an international convention was signed at Rome by representatives of a large number of nations, as a result of the efforts of the former International Institute of Agriculture now replaced by FAO. It is still nominally in force but it can hardly be regarded as ever being fully effective, and today its provisions are to some extent out of date. It has in places been supplemented by regional conventions, *e.g.* the recent European phytosanitary convention.

The matter has been taken up by FAO in recent years. In 1949 that body compiled and issued a digest of plant quarantine regulations in 22 countries which led to the drafting of a new convention at a meeting at the Hague jointly sponsored by the Dutch Government and FAO. This was circulated to the member nations of FAO and considered at the annual meeting of that body in 1950, but its adoption was postponed until the 1951 meeting.

Concurrently within the framework so provided FAO proposed to set up further regional conventions. Proposals are under consideration for South-East Asia and the South Pacific Region. Moreover FAO also proposes to continue to compile information concerning national plant quarantine regulations to encourage consistency and set up a world reporting service on the occurrence of plant pests and diseases of major crops.

All this is quite admirable and, provided that it can be worked effectively, should greatly assist in reducing the present extensive losses of food and other crops from pests and diseases. One cannot, however, be blind to the fact that cooperation of this type demands a peaceful atmosphere if it is to succeed and, however regretfully, one must admit that the present growth of intransigent nationalism in many under-developed countries, which, incidentally, stand to benefit most from provisions of this description, must continue to be a formidable obstacle to the full fruition of these excellent intentions.

Brazilian development

THERE is no country in the world with greater potentialities for development than Brazil. Its vast area of 3,288,000 square miles makes it, after Soviet Russia and China, the third largest individual territory in the world ; it is 250,000 square miles larger than the United States of America and more than double the size of India and Pakistan together. Its climate ranges from tropical in the north to fully temperate in the south and there is hardly any product that could not be grown there. It has vast stretches of grasslands in the south capable of raising large numbers of cattle and producing a wide variety of crops. Speaking of this region recently, Mr. Frank Bulcock, formerly Secretary for Agriculture in Queensland, is reported to have said that he considered it was destined to become one of the world's largest agricultural belts. In the north are the great stretches of tropical rain forest of the Amazon basin, the largest continuous tract of this vegetational type in existence. From them originated *Hevea brasiliensis* which now forms the basis of the great rubber industries of the Far Eastern tropics. In them are found many other naturally occurring products such as Babassou nuts, Brazil nuts, Carnauba wax and others which are at present extracted only from naturally occur-

ring plants, but which could, no doubt, be developed as commercially cultivated products.

The main difficulties which hamper development are lack of population, the total number of inhabitants being only 50 million, and inadequate communication facilities. There has been great urban development and the principal towns such as Rio de Janeiro and Santos are large modern cities, in which large populations are concentrated. The country is, however, mainly dependent on agriculture and it is estimated that well over 50% of the population is engaged in agricultural pursuits. Production standards are, however, low, and the position of Brazilian agriculture has been described as precarious mainly due to labour shortages and poor communications.

The principal crops grown are coffee, cotton, sugar, cocoa, citrus, fruit, maize, rice, bananas and tobacco, much of which is exported after local needs have been met.

For many years coffee, the principal export crop, suffered severely from overproduction and low prices and production was reduced. Latterly the world situation has greatly improved and stocks of Brazilian coffee which formerly were a depressing factor in the price situation have now been liquidated and the demand at remunerative prices is strong. It is reported that the exportable surplus for the 1951-52 coffee crop will amount to 14,800,000 tons.

In the past, the position in Brazil has been handicapped by political uncertainties and financial instability. It is now stated, however, that the Government have embarked upon a programme of development based upon a sound financial economy.

It yet remains to be seen how far these measures will succeed but there is no room for doubt that the possibilities for expansion are there and that Brazil must be regarded as one of the major potential assets in any plans for increasing world supplies of food and raw materials to meet increasing needs.

Smithfield Show, 1951

THE third post-war Smithfield Show and Agricultural Machinery Exhibition was held from December 3-7 at Earls Court in London. With more space than ever given over to the machinery exhibits, the show again gave the impression of being more an implement exhibition than a fat-stock show, particularly so because of the depletion of stock entries due to the prevalent outbreak of foot-and-mouth disease.

Perhaps it may come about that if this expansion continues the two sections will be divorced and organised as separate shows.

Since the war the show has always been well attended by visitors from overseas and this year was no exception. With the present emphasis on exports, most British manufacturers design and produce with an eye to overseas requirements as well as those at home and, although there were no startling innovations this year, modifications and improvements of last year's models gave an indication of the present trend of British agricultural engineering.

Increased consumer food prices

AS a result of the recent special price review under the Agriculture Act of 1947, consumers in the U.K. have now to face an extra charge of about £26,000,000 on the cost of their food. In consequence of the extra costs which farmers have been incurring since the annual price review of last February—and particularly the wage increase of eight shillings a week—the Government have decided to make this special award to tide them over until the next annual price review in February next.

There is no question of a policy change. Of the total figure of around £26,000,000, £16,000,000 will go to the farmer in the form of price increases on 1952 harvest crops and 1951-52 livestock products, while between £9-£10,000,000 is to be awarded in the form of a phosphatic fertiliser subsidy, the contribution being at a rate equivalent to about 30% of the present cost to farmers. Fertiliser prices have risen considerably of late and this £9,000,000 will, it is hoped, ensure that the purchase of fertiliser is not seriously decreased and national soil fertility lowered as a result.

Both these figures, £16,000,000 and £9,000,000, will be debited to the Minister of Food's account and it will be his job to get it back from the consumer. The overall food subsidy figure of £410,000,000, it will be noted, is not to be altered. Thus what has been expected for a long time has now come about and consumers will henceforth have to pay prices for food slightly more in accord with the real cost of production.

The only increase in price announced at the time of writing is for milk, which has gone up by a halfpenny a pint, but doubtless other increases will follow. The change will not be welcome to consumers, especially urban consumers, and will no doubt be made the target for criticism by the Government's opponents. On the other hand, the action taken appears to an unprejudiced observer as the only sane and logical step in Britain's critical food situation.

THIS MONTH'S COVER

Hauling timber from the forests of Finland on the fringe of the Arctic Circle, this Fordson Major is set in truly wintry surroundings. The timber is hauled to a loading place for further transport by trucks. *(Photo: Ford Motor Co.)*

World Agricultural Production – 1951

Stretching as far as the eye can see these stooks of harvested wheat form part of Saskatchewan's grain harvest

AN important service which FAO renders is the annual preparation of world reviews of the state of food and agriculture. The fifth of these, dealing with conditions during 1951, has recently appeared ;* it formed part of the documents presented to the sixth conference of FAO held between November 19 and December 7 in Rome.

Influencing factors

As a record of progress the report is disappointing, not to say disquieting ; the combined effects of the aftermath of war, increasing populations, continued political disturbances and unrest, unfavourable seasons, the diversion of energy to military preparations and the general unpreparedness of many nations for rapid and energetic development have combined to slow down progress. Even although some progress is observable, in many needy regions the *per capita* food consumption has not yet regained even the inadequate pre-war level.

There is, moreover, a danger that in planning huge defence programmes agricultural requirements may be overlooked, and this can not only reduce agricultural production in favoured regions of high development, but also exacerbate existing tensions in the more needy areas.

Armament production, expansion of industrial production and enlargement of the armed forces have made and, while the present trend prevails, will continue to make increasing demands upon labour forces in industrialised countries and lessen labour available for agriculture. Armament production may also limit the availability of materials and implements for agriculture. In the U.S.A. fertiliser supplies continued to be ample apparently, but in Europe shortages of fertilisers and pesticides have already been reported and this may become more serious in the future.

The existing political and economic difficulties throw into high relief the immediate outlook for world production of food and agricultural raw materials. Accordingly, the following summary of the position during 1951 is of great interest; it is based on a review recently published by FAO.

The world's economy was sharply influenced by the outbreak of hostilities in Korea. Following this there were two periods of large-scale buying of both food and agricultural materials by governments and by business organisations, the first after outbreak of hostilities in July, 1950, and the second early in 1951 after the intervention of China. As a result prices advanced at an extraordinary rate ; this was due not so much to an increase in current consumption but to government stockpiling, the building up of commercial inventories and speculation.

In some countries high prices have led to substantial increases in cash farm incomes, although net incomes have increased less because of the simultaneous rise in production costs, for both materials and wages. Indeed, in some territories increases in costs have been greater than increases in prices.

The general outlook

The outlook for agriculture is, therefore, to say the least of it, uncertain. Expanding activity buttressed by rearmament is creating large and increasing demands for raw materials of agricultural origin. On the other hand defence demands for men and materials threaten to limit resources for agricultural production and to reduce supplies of consumer goods. This may lead to continued price inflation and threats to the expansion of agricultural output. Moreover, difficulties in regard to payments for raw materials for manufacture in importing countries are increasing, although it is easing the exchange position in raw material exporting countries. Accordingly the future is becoming increasingly unpredictable, since it depends in large measure on future military and political developments.

The Regional Position

North America

Total production in the U.S.A. was about 2% less than in the peak year of

* The State of Food and Agriculture, 1951. *World Review and Outlook*, graphs and statistical tables, 90 pp., Rome, October 1951.

1949-50 ; the area harvested was 4% lower reflecting the sharp reduction in acreages of crops subject to the allotment programme, notably cotton, wheat and maize.

In Canada the agricultural output was 14% higher than in the previous year, due almost entirely to higher grain yields ; the wheat harvest was of poor quality owing to bad weather during the harvesting period. High grain yields were offset to some extent by lower production of fruit, tobacco, livestock and animal products.

Farm prices in the U.S.A. averaged 3% higher than the previous year, but these were offset by a slightly larger rise in operating costs, while net farm incomes were lower by reason of the smaller output. In Canada prices were about the same as in the preceding year but operating costs increased by more than 3%, the result being a slightly lower net farm income.

Expanding domestic industrial activity in the U.S.A. had a striking effect on imports of agricultural raw materials both in volume and value. Practically every major agricultural import increased from one-fifth to one-half in volume and far more in value.

The same cause is responsible for a drift of labour from farm work to industrial employment. In the U.S.A. the number of persons employed on farms declined from 8.8 millions in the second quarter of 1949 to 7.4 millions in the same period of 1951. In Canada similar proportionate reductions have occurred. In both countries it is assumed that imports of farm labour will be necessary.

The programmes for enormously expanded defence expenditure dominated the situation. If they continue unmodified by political or military developments internal consumption of food and certain agricultural raw materials seems likely to reach new record levels, while exports of food may decline despite strong foreign demands.

Western Europe

Between 1945 and 1950 great efforts have been made to restore agricultural productivity, with a considerable measure of success. In Western and Northern Europe production of major crops has caught up with population increases, although in Germany, Austria and the Mediterranean countries it still lags behind. Improved methods of agriculture and increased use of fertilisers are responsible for greater yields per unit area cultivated, except in Mediterranean countries.

Plucking tea leaves on a 600-acre tea estate in Java. The Assam Indigenous variety is mainly grown here

Picking ripe coffee berries in the Sao Paulo region of Brazil

Areas under sugar beet, oilseeds, pulses and grass are considerably greater than pre-war, but the breadgrain area is still below it, although this has been counterbalanced to some extent by better yields per hectare. Livestock production, which lagged behind in the earlier years, has strikingly improved notwithstanding that imports of coarse grains for feeding were four million tons below pre-war averages.

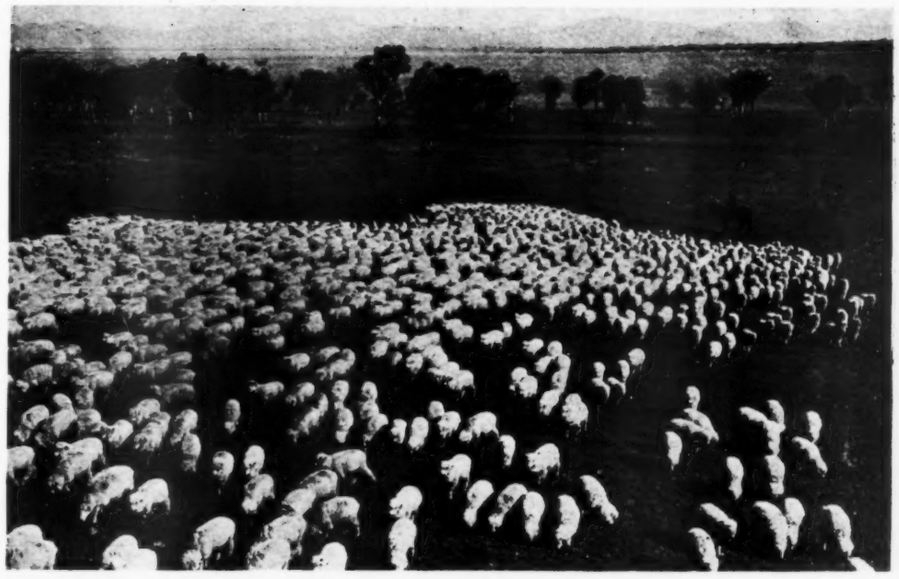
Trade within Western Europe in agricultural products has expanded, France in particular exported 40% more wheat than in the previous year.

World rearmament is creating fresh inflationary pressure and the rising prices for imported foodstuffs may be expected to compel countries to impose further restrictions on consumption. Farm production prospects depend on the pace and extent of rearmament both in European countries and the U.S.A., because

of its influence on the availability of materials and manpower. Despite recent improvements in food supplies and dietaries there are already signs of a slowing down and, in a few countries, a reversal of these favourable trends.

Eastern Europe and the U.S.S.R.

Information from countries behind the Iron Curtain is restricted. Production in Eastern Europe in 1950-51 was affected by the severe drought in the Danube basin. Of late years the areas under coarse grains have been appreciatively less than before the war but breadgrains have reached the pre-war level. Production of oilseeds and sugar have, on the other hand, substantially increased. There has been fairly rapid recovery in livestock numbers, and the pig population is appreciably higher than before the war. Meat production in 1949 was estimated at 65-75% of the pre-war level but may have expanded considerably since. Exports of agricultural products to countries outside the region depend on the extent to which they can import needed manufactured products and the trend is, therefore, unpredictable. Trade within the region, excluding Yugoslavia, has apparently expanded by 25%, and a closer integration of the economy of the whole region with that of the U.S.S.R. is apparently in progress.



Mustering sheep for shearing at a station in New South Wales, Australia

The use of machinery on German farms is increasing. An example is the employment of potato harvesters, as shown above

In the U.S.S.R. itself recovery in production continued in 1950 ; the total crop area increased by about six million hectares to 147 million hectares, though this was still below the pre-war level. Spring wheat, cotton, flax, sugar beet, and oilseeds all showed substantial increases in area and production, although grain output at 124 million tons was about three million tons below the target figure. The food position has improved, bread is no longer in short supply, but sugar and livestock products are still tight. Grain exports amounted to slightly over two million tons in 1949-50 and may reach two and a half million tons for 1951.

Industrial production in all countries is growing rapidly and farm collectivisation has been stepped up to supply industrial labour. In the U.S.S.R. industrial expansion is also proceeding vigorously with special emphasis on heavy industry. In agriculture efforts are being made to amalgamate existing collective farms to form larger scale enterprises in order to economise manpower and materials, but it is not yet clear how far this is succeeding.

Latin America

Most Latin American countries have been endeavouring to step up food production to keep up with rapid population growth. Cereal crops totalled 31 million tons, an increase of 15% compared with the previous year, the largest increase being shown by maize. Wheat production in Brazil in 1951 is estimated at 550,000 metric tons, 100% higher than in 1946 when the campaign to increase production started. Argentine wheat production for 1951 is estimated at 5.5 million tons. There have also been important gains in barley, oats and rye production. Rice production in Brazil, the most important producing country, showed some decline mainly on account of lower prices ; oilseeds production increased by 15%, while sugar also continued to expand.

Coffee production was somewhat lower, mainly because of unfavourable weather in Brazil and Colombia. Meat production is increasing slowly ; in Argentina, as a result of the signing of the recent agreement with the U.K., and continuing improvements in pastures, prospects for increased production have improved. Cotton production has improved slightly in Brazil, but in Peru it was less owing to inadequate water supplies for irrigation, and insect pests. The most noteworthy development is the continued expansion of cotton production in Mexico.

Exports are tending to become reduced by reason of growing internal demands consequent on population increase, and this is stepping up trade between adjacent South American countries and hampering outside exports. It may, however, be that increased cereal production will permit of increased exports, while larger exportable surpluses are anticipated for sugar, oilseeds and cotton. Prices are, however, the dominating factor, combined with the availability of imports of agricultural requisites. If, as a result of rearmament in the U.S.A. and Western Europe, these become curtailed it is bound to have adverse effects on agricultural production.

Africa

In the Union of South Africa excellent weather conditions led to record sugar and wheat crops. In North Africa, on the other hand, indifferent weather conditions led to returns that were barely average. Taking the continent as a whole, food production for local consumption varies greatly from year to year with seasonal conditions, while production of export crops is governed to a considerable extent by external demand and export prices.

During the past year, however, in many territories, prices of local food crops rose commensurately with those for export products and there was, on the whole, no very marked expansion in export surpluses of, for example, vegetable oils, cocoa, coffee, cotton or wool, despite accelerating price increases.

It is, indeed, unlikely that in the more tropical parts of Africa there will be any marked change in the general agricultural pattern until long-term agricultural projects for expansion begin to bear fruit.

The most that can be said is that the steep rises in prices for export staples have produced an uneasy and uneven prosperity in most African territories.

Generally speaking there has been a trend to expand export production at the expense of food production, often accompanied by declining fertility, and in some places areas which were formerly self-supporting in food have had to import grain supplies. It has now become widely recognised that large-scale food production schemes are a necessary corollary to intensive export crop production. A number of schemes are in progress to help African farmers to adjust production methods to suit the changing conditions ; they should in the long run pave the way for sounder developments.

The Near East

In general 1950-51 was a good agricultural year in the region. The estimated total production of all cereals was 23.5 million tons—11% above pre-war figures. Excluding millets and sorghum, grain production was nearly three million tons higher than in the previous year. Pulses and citrus fruit were lower, while sugar also showed a slight decline. On the other hand potato and cotton production was well up, the latter despite a substantially lower production in Egypt.

Since the war the total cultivated area in the region has increased by 10%, mainly by reason of increased irrigation, but this has not kept pace with population gains which amount to 20%. With the possible exceptions of Turkey and Egypt food supplies continue to be insufficient in the other Near Eastern countries.

Under the influence of external demand many countries have become heavily dependent on export crops. Cotton production has expanded from 560,000 tons pre-war to 690,000 tons in 1950. Of this, 410,000 tons were shipped and together with 18,000 tons of wool and other commodities, provided ample foreign exchange. This and growth of population have converted Egypt and the Lebanon into food deficit areas. In 1950-51, Egypt imported about 500,000 tons of wheat, which was partially offset by the export of some 173,000 tons of rice. Most other countries have precarious grain surpluses and have to rely on imports in bad years.

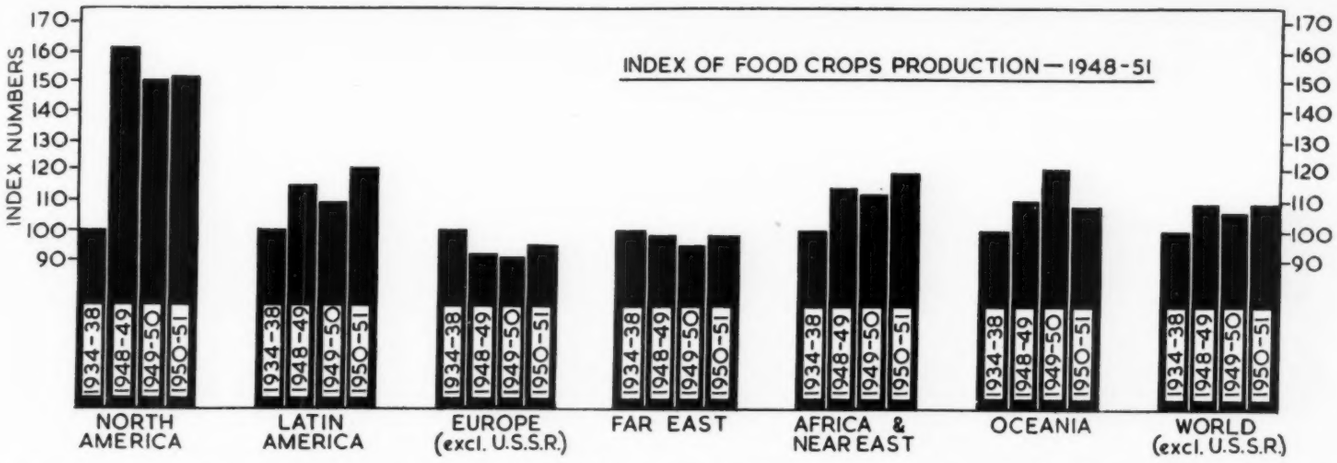
Increasing industrialisation has stimulated employment outside agriculture and this seems not unlikely to affect agricultural production and to stimulate inflationary pressure. Moreover, western rearmament programmes leading to decreasing supplies of machinery, fertilisers and pesticides may seriously affect the intensive agriculture of Egypt and Turkey. With increasing demands for raw materials for export, especially cotton, increasing diversion of land from food production may occur, although improvements in irrigation in some areas, notably in Egypt, enable the cultivation of cotton crops in the summer and food crops in the winter months to be carried out on the same land.

The Far East

Of all areas the situation in the Far East is, perhaps, the most disquieting. The Korean war, the Communist guerilla warfare in Malaya, the campaign in Indo-China and disturbed conditions in other countries combined to worsen a situation already sufficiently threatening as a result of population increase, aggravated last year by the occurrence of widespread food shortages in some regions as the result of unfavourable seasons and drought conditions. Moreover, the demand for certain vegetable raw materials produced in the region, notably rubber, oils and fats, and also minerals, notably tin, was stimulated by rearmament, and greatly increased inflationary pressure on prices for foodstuffs and consumer goods is reflected in rapidly rising cost of living indices.

On balance agricultural production in 1950-51 slightly exceeded that of the

This automatic maize picker, seen at work in the corn belt of the U.S.A., harvests 24 to 30 acres per day



Index numbers are based on the production of wheat, rye, oats, barley, maize, rice, potatoes, sugar and oils. Uniform price weights are applied to total output without deduction for quantities fed to livestock

Methods for computing an index covering not only food crops, but also livestock products, are at present being investigated in co-operation with other international agencies

preceding year, but probably failed to reach the post-war peak of 1948-49. All food deficit countries increased their areas under grain crops but proportionate total gains in production did not ensue mainly because of widespread crop failure in India owing to drought. Over 8 million tons of food grains were imported into the region of which six million went to India. Pre-war the region as a whole had a sizeable export surplus.

On the other hand China experienced good harvests after the disastrous crops of the previous year and grain imports ceased. The improvement was mainly due to a favourable season but flood prevention work and the policy of the Peking Government of providing incentives for increased production also played their part.

Japan had a record harvest and American aid to the civil economy terminated on July 1, 1951.

Rubber production continued to expand under the influence of external demand and reached the record total of two million tons; tea production also exceeded pre-war levels, but outputs of jute, hard fibres, sugar, oilseeds and vegetable oils, cotton and tobacco, remained well below pre-war levels.

Government policies aim at steadily increasing agricultural production, and particularly foodstuffs. The Colombo plan is intended to benefit India, Pakistan, Ceylon, Malaya and other countries in the Far East. India plans to extend the irrigated area by six million hectares and the total cultivated area by two million hectares by 1955-56, which it is hoped will expand production of food grains by 7.2 million tons and achieve self sufficiency in cotton and jute. Elsewhere similar plans are under way.

High prices may, however, occasion diversion of land from food production to cash crops for export, while difficulties in procuring supplies of agricultural machinery and fertilisers may handicap production. Moreover, increasing threats from locust attack have to be taken into account in India and Pakistan. In addition, ever growing population increases add to the difficulties. In the period ahead coordinated planning and inter-governmental co-operation are bound to become more essential if the difficulties are to be surmounted and the best use made of available resources both material and technical.

Oceania

The outstanding feature in Australia and New Zealand in 1950-51 was that while the value of agricultural production showed a substantial increase, its volume was very appreciably less owing mainly to reduced cereal production in Australia as the result of excessive rains in the eastern states. Sugar production, however, increased to more than a million tons, while the population of cattle and sheep also rose appreciably, although pigs declined. Production and domestic consumption of meat and dairy products reached record heights, and wool production increased also under the influence of high prices.

High prices and increased purchasing power have increased inflationary pressure, and in both countries the cost of living rose sharply. Notwithstanding this, the existence of ample food supplies has placed Australia and New Zealand among the best fed nations in the world.

Conclusion

The foregoing condensed account gives an outline of the position in August, 1951, when the report was written. Since then trends have not been materially modified although they have in some cases become accentuated. The whole position is dominated by inflation and rearmament. Governments are attempting to check the rising tide of inflation by a variety of means including higher taxation.

The report also includes sections dealing with a number of individual commodities and a survey of the position in relation to supplies of fertilisers, agricultural machinery and equipment.

Photos: p. 6 (bottom), Panair de Brazil; p. 6 (top), Indonesian Embassy, London; p. 7 (top), Australian News and Information Bureau; p. 5, Agricultural Commissioner for Canada; p. 8, U.S. Information Service; p. 7 (bottom), German Consulate, London.

Another Productivity Team

The Anglo-American Council on Productivity, with E.C.A. technical assistance, has sent a specialist team, under the sponsorship of the National Farmers' Union, the National Federation of Fruit and Potato Trades and the Retail Fruit Trade Federation, to the U.S.A. to study there the short-term storage and pre-packaging of fruit and vegetables.

Considerable importance attaches to the development of techniques by which produce (from markets temporarily over-supplied) can be stored without deterioration for short periods, since the flow of supplies to market could thus be regularised; also their pre-packaging, where involved, would make it easy for customers to identify brands and qualities.

It is the team's mission to study any new developments in America which are likely to help British marketing problems, and to this end visits have been planned to many eastern states where climatic conditions have some similarity to those in the United Kingdom.

A report will be published in due course.

Industry's Contribution to Agricultural Research

NONE can gainsay the impressive advances which have followed the application of scientific research to agriculture. If the knowledge so gained during recent years could be intelligently applied on a world-wide scale, an end could be put to the shortages of food which at present threaten the world's peace and security, and the long-term outlook would be materially improved.

Agricultural research is normally regarded as lying within the special province of official research and experiment stations, or of organisations set up by agricultural producers with the support and assistance of territorial or regional governmental authorities. No doubt this is in large measure correct, but there is also no doubt that the practical application of the results of research demands the intervention of private enterprise to produce the necessary materials and machinery.

This has led manufacturing enterprise to embark upon research on its own account, since, even in the initial stages, it is apparent that the application in practice of new principles often necessitates modifications or developments of the original discovery or invention which can only be evolved by additional research. From this has followed the rapid extension and development of research, sponsored and financed by commercial firms. Today the majority of the larger firms engaged in the manufacture of fertilisers, crop protection products, agricultural machinery and so forth maintain scientific staffs of high scientific and technical competence coupled with experiment stations of considerable size and laboratories provided with the latest scientific equipment.

There has, moreover, been an increasing amount of collaborative experimental work between commercial organisations and planters and farmers, not only in the United Kingdom, but also in countries overseas. This has also extended to the official sphere and in many cases scientific officers attached to official research organisations and advisory services have collaborated with the workers of private organisations in the solution of agricultural problems; an even more striking fact is that in various parts of the world governments and official organisations have at times enlisted the help of commercial firms to undertake research on problems of a specialised and difficult nature.

It is, in fact, not too much to say that the research work now being carried out by commercial organisations constitutes a most valuable additional resource in helping to increase agricultural production. It is the belief of this journal that the importance of this comparatively new development and its potentialities may not be sufficiently widely appreciated. On this account we have embarked upon the publication of a series of articles describing the research work carried out by a number of leading commercial firms in the agricultural field. The first of these, dealing with the work of Plant Protection Ltd., appears below; it is from the pen of Dr. E. Holmes, Director of Research of the organisation. Other articles dealing with the work of other organisations will appear in subsequent issues of WORLD CROPS. The Editor takes this opportunity of acknowledging the assistance of the many firms who have made possible the publication of this series.

No. 1 Plant Protection Ltd and Crop Protection

E. HOLMES, M.Sc., Ph.D., F.R.I.C.

IT is proposed in the first article of this series to consider how the crop protection section of agricultural research has been advanced by one company, Plant Protection Ltd. (P.P.). This company has two parents, Imperial Chemical Industries Ltd. and Cooper, McDougall and Robertson Ltd. (I.C.I. and C.M.R. respectively). I.C.I.'s interest in crop protection is probably similar to that of many other large chemical corporations. At the time of its formation in 1926 certain divisions of the company had more than a nodding acquaintance with insecticides, fungicides and related products. For example, the Cassel Cyanide Co. was providing sodium cyanide for the old 'pot' method of tent fumigation of citrus trees, and Brunner Mond and Co. was sending soda crystals to Ireland and elsewhere for the farm preparation of the copper fungicide, Burgundy Mixture, for use against potato blight. But these activities were only incidental to the main business of the companies in the heavy chemical industry.

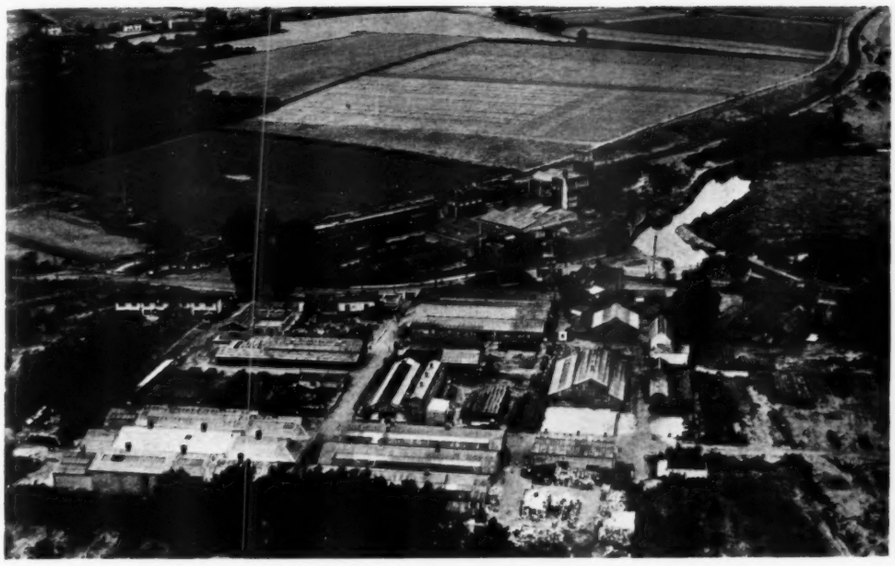
Development of the organisation

It was in the late twenties and early thirties that the real possibilities in the field of synthetic chemistry became apparent. I.C.I. proceeded to develop synthetic wetters and spreaders in place of soaps, organo-mercury and all-organic fungicides in place of sulphur and copper and, later, entirely novel insecticides of outstanding performance.

C.M.R., on the other hand, had been in the cattle and sheep dip business for many years—since 1851—and had been largely instrumental in the development of the insecticidal uses of derris root since about 1912.

P.P. was formed on October 1, 1937, to amalgamate these interests, to give fuller scope for these obvious potentialities and, incidentally, to provide the British Empire with easily its largest unit manufacturing crop protection chemicals.

Even before P.P. was formed, I.C.I. had found it necessary to set up its own biological laboratories to handle insecticides and fungicides at Hawthorndale, alongside Jealott's Hill, which had already made a name for itself in the fields of soils, fertilisers and animal nutrition. In the first ten years of its existence Hawthorndale



Aerial view of the Yalding works of Plant Protection Ltd.

'screened,' *i.e.*, carried out initial sorting tests on, some 14,000 chemicals.

More recently, in 1945, a further stage was reached when P.P. set up its own research station at Fernhurst, near Haslemere, for the extended testing of promising new agricultural chemicals before their introduction to farmers in Britain and the rest of the world.

How the organisation works

How does the organisation work today? Practically every I.C.I. chemical research laboratory—in Ardeer, Billingham, Manchester and Widnes, to name the most important—sends candidate chemicals to Jealott's Hill and Hawthorndale. They are there prepared as simple laboratory formulations such as dusts, solutions, dispersible powders or emulsions, and tested on the small scale but by accurate methods against a representative selection of insects, fungi, bacteria and weeds. When any shows promise, the 'lead' is followed up by systematic synthetic work in the particular chemical family to determine whether the new discovery is the best of the family. This is seldom the case.

If one (or more) of the family shows real promise then it is properly formulated at Hawthorndale or Jealott's Hill (with assistance, if necessary, from the I.C.I. research laboratories, or from the laboratories of P.P. at Yalding, Kent) into a product capable of being applied through the kind of equipment available to farmers or horticulturists. Trials on a field scale are carried out by Hawthorndale or Jealott's Hill to show whether a case exists for fuller development. Such points as safety in use both to man and animals, seeds and plants and so on are covered at this stage.

If the all clear is given the product is next taken over by P.P.'s Technical Department at Fernhurst for extended evaluation to make sure it will function satisfactorily under different climatic and soil conditions, on different varieties of the crops concerned, and to ascertain that the cost bears a reasonable relationship to the anticipated benefit. During this stage further formulation work at Yalding is frequently necessary.

All this may sound rather complex, but consider how at each step the particular part of the problem is handled by real specialists. There are no better chemical research laboratories than those of I.C.I. in any part of the world; Jealott's Hill and Hawthorndale are now recognised as second to none in their respective fields; and, more recently, P.P. has, with I.C.I. and C.M.R. backing and its own strenuous efforts, established itself as a leader in the science of crop protection.

An illustrative example

Let us now see how this machine functions, choosing as one example the discovery in 1943 of the extraordinary insecticidal value of the gamma isomer of benzene hexachloride (BHC) and its subsequent development.

A sample of crude BHC was first tested in 1937 at Hawthorndale, and examination of the relevant company report showed that it was insecticidal. But it was tested against an insect of no great importance to the company and large outlets in agriculture were not envisaged. The report remained in the archives.

Need for derris substitutes

Towards the end of 1941, with the Japanese becoming obstreperous in the Far East and shipping space for derris root difficult, we in P.P. asked our colleagues in I.C.I. to attempt to find as substitute for derris a synthetic chemical capable of being produced in Britain under wartime conditions. The particular outlet first considered was the control of turnip flea beetle.

Mr. O. B. Lean, Mr. F. J. D. Thomas of Hawthorndale and the writer, con-

Carrying out a soil analysis with the help of a pH meter at Fernhurst

sidered possible candidates from the thousands already tested. We chose some because they had been active against other insects, some because they were very odorous and might prove repellent, and some on simple hunches. The various I.C.I. Divisions were then asked to supply working samples. The General Chemicals Division said that, as we had asked for two derivatives of benzene hexachloride, strongly smelling materials that had been sent to Hawthorndale for another research project, we had better have also the parent chemical, benzene hexachloride. This would be cheaper to make and many pounds of it happened to be available, again owing to an earlier chemical research project. To this extent its ' discovery ' was an accident.

After exhaustive laboratory tests, field work proceeded under Mr. Thomas and his colleague Mr. H. R. Jameson and very soon it became apparent that BHC was promising. Emphasis was switched to this chemical, whose promise was confirmed in field trials.

BHC provides the solution

Normally we expect to test out new developments of this kind for at least three agricultural seasons, but the derris situation had deteriorated so badly in the meantime that we took a chance and decided to introduce a BHC insecticide for flea beetle control in 1943. In spite of war-time difficulties an improvised chemical plant produced some tons of materials during the winter of 1942/43 and when samples arrived at Hawthorndale they proved just about *four times* as insecticidal as the best of previous research samples.

Manufacture went ahead and proved successful, but the above observation posed a very real problem for the chemists and entomologists. It had already been shown that pure samples of the separated alpha and beta isomers from the I.C.I. Widnes laboratories were not insecticidal, although they accounted for the greater part by weight of the crude product. An exciting search for the unknown highly active constituent commenced. The writer well remembers the period during which we had a succession of reports giving the relative insecticidal performance of the different fractions against different insects. Finally, when the gamma isomer was isolated and tested it dawned on us, and was experimentally established, that this was the only constituent having high value—but what a value ! The other isomers appeared poorer and poorer, as they were purified from residual amounts of the gamma.

BHC in locust control

At this point the writer has to confess that several times in the past few years he has been guilty, quite unwittingly, of perpetrating a romantic story of the discovery that BHC was extremely toxic to locusts.

The facts are that back in 1933, when Mr. Lean and the writer were surveying world markets for insecticides, we emphasised the great need for a locust poison non-poisonous to mammals. With this in view, when we started up the Hawthorndale Laboratories we built up a colony of locusts so that any promising chemicals could be tested against them. So soon as BHC showed promise against other insects, notably flea beetle, as a part of the normal routine it was at once tested against locusts.

The discovery of BHC as a locust poison was a reasoned development from earlier work, and Mr. Lean actually killed locusts in the field in Persia with BHC before we had the laboratory accident with our locusts at Hawthorndale which has led to some romancing. So much for human fallibility.

The *subsequent* accident occurred when a laboratory assistant was one day set to grind a few grams of BHC and, as it happened, carried out the operation with a pestle and mortar in a laboratory containing several thousands of caged locusts. Next morning some 80% of the locusts were dead.

But if Mr. Lean has corrected the writer on the above facts he has recently corrected himself on previous calculations regarding the activity of BHC. He now finds that three grams (about one-tenth of an ounce) of gamma-BHC, suitably distributed per acre, are capable of killing

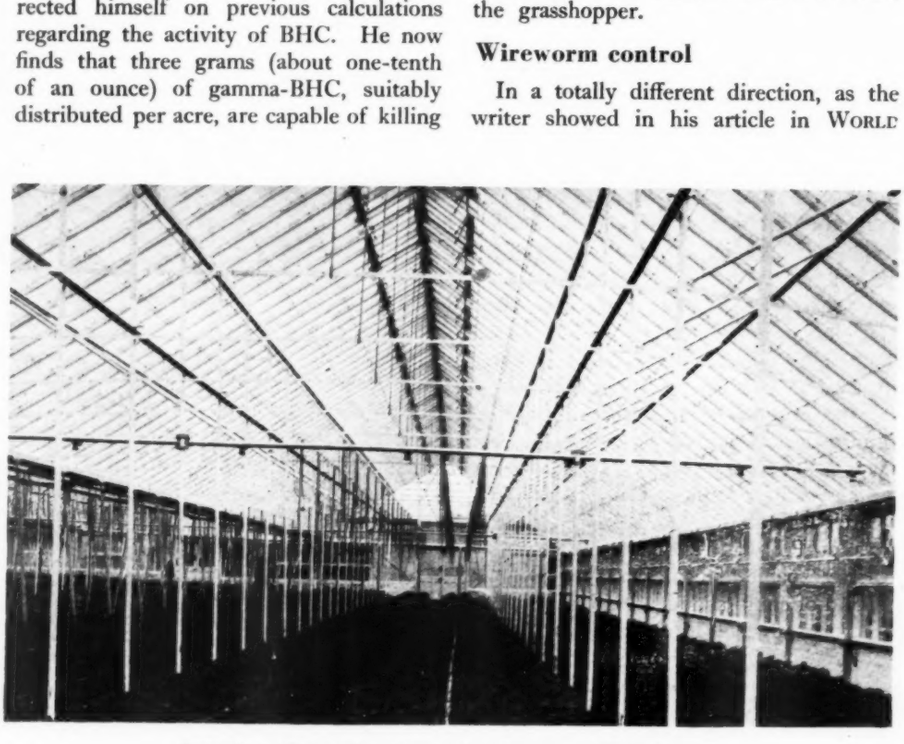
Inspecting Agar cultures in one of the laboratories at Fernhurst

1½ million locust hoppers weighing about one ton. Although this is only about one-tenth the toxicity previously indicated, it is still very impressive.

Today BHC is being used on an enormous scale for the control of locusts all over Africa, the Middle East, India and Pakistan, and South America. Curiously enough it does not seem very efficient against the North American equivalent of the locust, the grasshopper.

Wireworm control

In a totally different direction, as the writer showed in his article in WORLD



Interior of wooden type glasshouse at Fernhurst

CROPS of February 1951, page 54, BHC proved extremely efficient against wireworms, and the advent of the technically pure gamma isomer made possible a new technique of seed dressing application giving protection to cereals against wireworm attack at very low acre cost.

From these beginnings BHC is now used to solve very numerous insect problems in all parts of the world. But the ' accidents ' would not have happened or been indicative of things to come if P.P. and its parents, I.C.I. and C.M.R., had not possessed a closely integrated team of specialists in the chemical, physical, biological and farming fields.

Conclusion

Extension work on these findings is carried out all over the world. P.P. has at present, or has very recently had technical men—entomologists, mycologists, botanists or chemists—working in Canada, the U.S., Mexico, Cuba, Trinidad, Jamaica, Colombia, Brazil, Peru, Chile, Uruguay, Egypt, Sudan, Uganda, Kenya, Tanganyika, Israel, Syria and Lebanon, Turkey, Iraq, Persia, Ceylon, Malaya, India, Pakistan, Jordan, S. Africa, and Rhodesia, in addition to many of the main countries of Europe.

The work covers detailed field experimentation, larger scale demonstration, lecturing and writing, and the production and display of films. P.P.'s own film unit has recently returned from Cyprus and the Middle East and plans shortly to work in the West Indies.

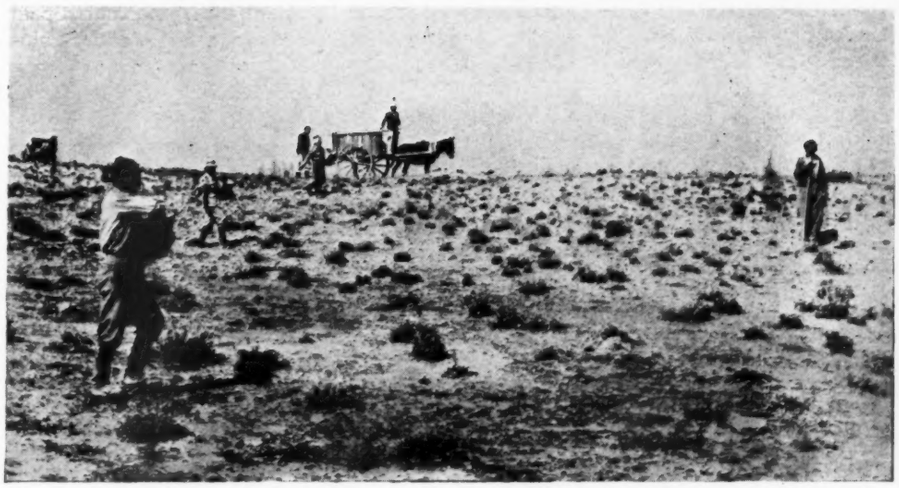
Everywhere a body of goodwill has been built up with governments, universities, research stations and farm institutes and last, but not least, farmers all over the world.

It is not surprising, therefore, that Plant Protection Ltd. feels that in its work on crop protection it is helping the all-important world problem of crop production.

Israel's New Cotton Mill

The corner-stone of a new cotton weaving mill, to be erected by the Palestine Cotton Mills, Ltd., and a group of investers from Britain, has been laid in Hadar Yosef.

It is expected that the mill, whose construction will cost I£135,000, will be in operation within a year. It will be equipped with British and Swiss machinery costing about 1,000,000 Swiss francs and will raise the Palestine Cotton Mills' production capacity from 27% of the country's requirements to 35%. The number of workers employed by the firm will increase from 350 to more than 450.



Hand application of locust bait, containing BHC

FAO Meets in Rome

SIXTH SESSION OF THE FOOD AND AGRICULTURE ORGANISATION CONFERENCE

THE sixth session of the FAO conference which took place in Rome between November 19 and December 7, 1951, will almost certainly be ranked as among the most important which have so far been held. It was attended by delegates from 66 member countries.

It was the first to have taken place since the transfer of the Headquarters of the Organisation from Washington to Rome, early in the current year, while at it the policies of the various divisions were passed in review, the programmes and budgets of the Organisation for 1952-53 decided, and the world situation in regard to food and agriculture exhaustively examined and discussed.

As a preliminary, meetings of the Council had been held under the presidency of Viscount Bruce, the independent chairman, during the preceding week at which the various documents and reports to be presented to the conference were scrutinised and adopted.

The new buildings

As a prelude to the conference, the new buildings which had been constructed by the Italian Government to house the organisation were formally handed over to the Director-General by the Italian Prime Minister, Sr. de Gasperi, who in his speech referred to FAO as one of the most powerful instruments of peace. In his speech of thanks, Mr. Norris E. Dodds, the Director-General, paid a tribute to those responsible for the completion of the building in a style worthy of the great tradition of Italian architecture. He also tendered the sympathy of the whole conference with the Italian Government and people in the recent disastrous floods in the Po valley.

Plenary meetings

After the handing-over ceremony the Director-General declared the conference open. It elected as its chairman Sr. A. Fanfani of Italy and as vice-chairmen Dr. G. S. H. Barton (Canada), H.E. E. Z. Angel (Columbia) and Phra Chuang Kashetra (Thailand).

In his opening address the Director-General referred to the difficulties which had inevitably accompanied the transfer of the headquarters of FAO to Rome, which had, nevertheless, been satisfactorily surmounted. More than 50 countries had received assistance from the expanded Technical Assistance Programme. The programme suggested by the Council envisaged an expenditure of $5,000,000 with a supplementary budget of $500,000. The measure of what member Governments wished to do was expressed by the amounts they were willing to expend.

The opening meeting was also addressed by Dr. Gunnar Myrdal, Executive Secretary of the UNO Economic Commission for Europe, on behalf of Mr. Trygve Lie, Secretary-General for UNO. He wished the conference success and emphasised the importance of the economic development of under-developed countries.

Dr. Torres Bodet, Director-General of UNESCO also spoke and warned the

Conference against the risk of introducing new techniques into under-developed countries without adequate parallel educational preparation.

At the second plenary meeting, Dr. Brock Chisholm, Director-General of WHO, pointed out the interdependence of progress in agriculture and health. He also emphasised the importance of ensuring that in programmes of assistance people should not be robbed of their opportunities of developing their own social responsibility by having things done to them and for them.

Lord Bruce's address

At the third plenary meeting Lord Bruce, as President of the Council, spoke of its work as the executive body of FAO. The expanded Technical Assistance Programme should not be considered as a separate activity of FAO but only as one aspect of its work. He referred to the increasing magnitude of the economic problems which could only be solved by international collaboration through the specialised agencies of UNO. Their activities were closely interrelated and they should all act together as one team. It was encouraging to note that this was becoming increasingly recognised. Co-ordination and co-operation are essential if the aims of FAO are to be achieved.

He referred to the advantages which had followed the action of the Council in appointing an independent chairman.

Lord Bruce has resigned his tenure of office as chairman, and the Conference unanimously passed a resolution expressing regret at his resignation and appreciation of his services in that capacity.

Mr. Charles Brannan's address

At the same meeting, Mr. Charles F. Brannan, American Secretary for Agriculture, delivered an address in which he outlined three vital steps to combat the increasing divergence between expanding populations, growth rates and food production. The first was to achieve rapid and far-reaching increase in food production, the second to achieve better distribution and the third to improve the tenure and living conditions of millions of food producers.

All these must be carried on at a time when a considerable share of the resources of many nations must be directed towards military defence programmes.

But it would be misleading to say that these urgently needed improvements in agriculture and food production must be made in addition to the defence effort; they are in fact a part of that effort.

The conference also heard addresses from the representatives of the United Kingdom, Belgium, the Netherlands, Spain and Thailand. It passed an official resolution conveying its sympathy with the Italian Government and people on the disastrous floods in Northern Italy and appointed a Committee to collect funds to help the victims of the floods.

Subsequently, the conference approved the agenda and established three commissions to deal with various items.

Appointment of commissions

Commission I was concerned with the world outlook for food and agriculture. Its chairman was Mr. Charles F. Brannan with Shri K. M. Munshi, Minister of Food and Agriculture in India, and Mr. S. L. Mansholt, Minister of Agriculture in the Netherlands as vice-chairmen.

Commission II dealt with the technical work of FAO. Its chairman was Mr. O. G. S. Corea, Ceylon Ambassador to the U.S.A., with Sir Gerard Clauson of the British Colonial Office and Mr. C. A. de Souza of Portugal as vice-chairmen.

Commission III dealt with legal, administrative and fiscal matters. Its chairman was Mohamed Ali el Kilany Bey, Under-Secretary for Agriculture in Egypt, with Mr. S. J. de Swardt, Chief of the Economics and Markets Division in the Department of Agriculture of South Africa, and Mr. H. S. Palma, former Minister of Agriculture in Chile, as vice-chairmen.

Subsequent plenary meetings

The fourth plenary meeting was addressed by representatives of India, Western Germany, Yugoslavia, Israel, Viet Nam, Egypt and the Philippines.

In his speech the delegate for India emphasised that his country looked to FAO to establish a common responsibility for meeting primary wants. It had already helped to develop a world consciousness of common responsibility. But this was not enough; it still remained to initiate and mobilise efforts to translate this sense of responsibility into effective action, and the question was how to make FAO an effective instrument for co-ordinating and directing efforts in this direction.

At the fifth plenary meeting speeches were heard from the delegates of Venezuela, Iraq, Mexico, Ceylon, Austria, Brazil and Ecuador. The delegate from Ceylon, after outlining the serious position of the rice consuming countries of the world, urged that the conference should give serious consideration to the question of the possibility of restoring the rice allocations.

Subsequently Argentina, Nepaul, Laos and Japan were admitted to membership of FAO, raising the total membership to 70 nations, with, however, the withdrawal of Hungary and China pending.

Proceedings at commissions

At the initial meeting of Commission II a note of grim urgency was sounded by the Director-General. He pointed out that world food production was not keeping up with population increase, nor was there any assurance that the limited increase achieved so far would be accelerated or even continued. There had been a series of conferences and recommendations, but they had not been carried out. As a whole, member countries had not fulfilled their obligations, nor put into operation in their own countries on a sufficient scale the recommendations they had themselves made. The time had come for a change of heart and a determination to do better in the future. He laid great stress on the need for implementing programmes at the farm level and for the establishment and development of extension services by the Governments themselves. FAO could assist in this if so desired. He suggested that FAO could organise and operate a considerable number of training centres for extension workers, and, given the resources, could also provide supplies of seed, fertilisers, pesticides and equipment to be used in local demonstration projects.

Sir Herbert Broadley, Deputy Director-General of FAO pointed out how the Expanded Technical Assistance Programme had enabled a programme to be presented to the Conference comprising a wide range of field activities of benefit to member Governments backed by an efficient headquarters' service. This had given FAO a spearhead for its work and had infused a new inspiration into the organisation.

(*At the time of going to press the Conference is still in session. We hope to publish an outline of the subsequent proceedings in our next issue.*)

Austrian Production of Ammonium Nitrate of Lime

Austrian production of nitrogenous fertilisers (ammonium nitrate of lime) reached the record level of 247,000 tons during the first seven months of last year. Average monthly production was 35,400 tons against 30,000 tons in 1950.

Exports during the first six months of last year amounted to 150,925 tons and earned the equivalent of 136,580,000 schillings in foreign currencies, against 174,200 tons (147,640,000 schillings) in the first half of 1950.

The principal export destinations were the U.S. with 46,262 tons, Poland 34,000, Egypt 30,600, France 10,000, Israel 6,000, Spain 5,600, Czechoslovakia 4,200, Britain 2,500, Portugal 2,500 and Italy 1,900 tons.

Gezira Board ginneries, at which lint is separated from the seed cotton and baled

The Gezira Scheme in the Anglo-Egyptian Sudan

PART I

H. FERGUSON, B.Sc., N.D.A., N.D.D.

Chief Agronomist, Research Service, Sudan Ministry of Agriculture

Below we reproduce the first of three articles describing the developments in the Anglo-Egyptian Sudan, which within the short space of less than 40 years have converted an arid and marginally productive plain into a highly productive region. The scheme constitutes one of the best examples of organised peasant agricultural development which the world has seen. It is remarkable also because it is based on preliminary scientific experiment followed by development on an ordered plan. It is, moreover, entirely a British achievement. The article has special topical interest by reason of the difficult political situation which has arisen of late in regard to Anglo-Egyptian relations.

THE Gezira is that part of the Sudan which lies between the Blue and White Niles from their junction southwards roughly to the railway line where it crosses between the two Niles. This region is an extremely flat plain of approximately five million acres, of which three million are irrigable. The possibilities of irrigating this region were considered very soon after the condominium was constituted, and these were crystallised in a report by Sir William Garstin in 1904.

History of the developments

Development was carried out logically. A detailed survey of the region and a systematic study of the whole problem was started almost at once. The registration of all native-owned land and the extension of the railway line from Khartoum southwards were other important preliminaries completed well in advance of the main project. In 1911 experimental cultivation of cotton and wheat was started at Tayiba in the central Gezira on a pilot scheme watered by pump irrigation, and in 1913, after cotton had been grown successfully, the project to build a dam at Sennar in the Blue Nile was finally approved. Funds were obtained by floating a Sudan Government loan which was guaranteed by the British Treasury. The fall in the value of money after 1914 caused financial difficulties, and it was only the energy and persistence of a number of individuals which encouraged the British Government to guarantee a further loan and saved the scheme from being abandoned. Apart from members of the Sudan Government and the Sudan Plantations Syndicate Ltd., much credit is due to the British Cotton Growing Association for their support at this stage.

The dam was started in 1914, but the first world war delayed its completion till 1925. In the meantime three other pump irrigation schemes were started in different parts of the central Gezira. In these, experience of planning and management was acquired which was the basis of the organisation finally agreed on in 1919. Supervisory staff and cultivators also learned much about cotton growing on these schemes. Thus the fully fledged scheme started with the great advantages of a tried system and a trained staff. 1918 also saw the start of an independent Gezira research service which has made an outstanding contribution to the success of the undertaking.

Nature of the scheme

The Gezira scheme started with 300,000 acres canalised. The irrigated area has been expanded at intervals since then, and with the completion of the latest extension

in 1952 the total canalised area will be approximately one million acres. In any one year more than one half of this area is fallow, 250,000 acres under cotton, 125,000 under 'dura' (*Sorghum*) and approximately 60,000 acres under 'lubia' (*Dolichos lablab*). Egyptian cotton has been the main crop since the beginning, and its efficient production continues to be the prior consideration. This crop on an average produces around 250,000 bales (under 50,000 tons) of raw cotton per year, but yields and prices, and consequently profits have varied considerably during the history of the scheme. On the whole the Gezira cotton crop has been an extremely profitable one and has become the Sudan's main source of wealth.

It does not do justice to the Gezira scheme to define it as a cotton production undertaking. Besides cotton, enough dura, which is the staple cereal of the country, and enough fodder (lubia and dura straw), are grown to meet the needs of the Gezira inhabitants and their livestock. Disastrous famines occurred in the days before irrigation, but now that good crops are ensured every year the populace enjoys a stability and security without which no progress could have been made. The scheme has been a success politically and socially as well as economically. The real measure of success is not the immense profits of recent years, but the fact that the scheme weathered the storm of the early 1930's when poor yields and low prices coincided.

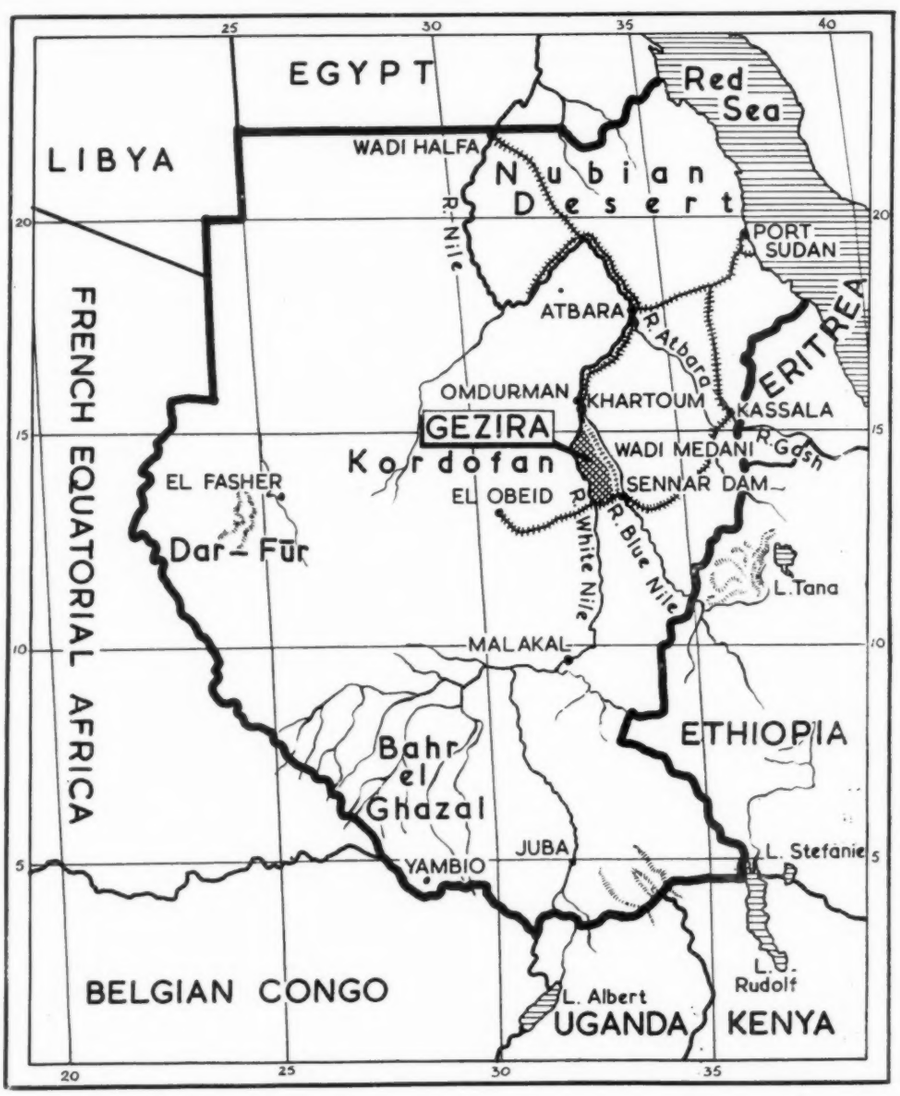
In recent years the Gezira scheme has been held up as a model of successful agricultural development, and, though the main object of this series of articles is to describe the agricultural aspects of the scheme, it is topical to mention briefly some of the other factors which have contributed to its success. The basis of this success is, of course, the ecological suitability of the Gezira for Egyptian cotton and its limited range outside Egypt and the Sudan. The satisfactory exploitation of this fundamental fact owes much to the adequacy of the preparations and trials which preceded the main project, and which resulted in an organisation able to carry the undertaking through adversity as well as prosperity.

As will be explained below the scheme is organised on a partnership basis, the three partners being the Sudan Government, the tenant cultivators, and the management.

The status of the cultivator

Lord Kitchener, who was in 1913 the British Agent General in Egypt, insisted that the interests of the native inhabitants of the region should be given full con-

Giant excavator widening the main irrigation canal



Map of the Anglo-Egyptian Sudan showing where the Gezira lies

Gezira tenants at an agricultural show

sideration and that they should participate as partners in the scheme. The first step was to establish the title, and register the ownership of all land within the range of the scheme. Individual properties were of irregular size and shape and could not be fitted into the regular layout required for irrigation. By ordinance the government undertook to pay each owner a ground rent of ten piastres per feddan* for a long lease of his land. The land was then canalised and divided into holdings of originally thirty, but now forty feddans, which was considered to be as much as one family could work.

The land owners were entitled to one of these tenancies for themselves and could nominate tenants for the number of holdings equivalent to the remaining area of their land. Further tenants were nominated by the government and management. The present rule is that, by right, landowners with sufficient land are allowed two tenancies for themselves and can nominate tenants for three further tenancies from their own families. The remaining tenancies are allocated to previous cultivators of the land. The tenancy is an annual one, but the owner cultivator is entitled to its renewal subject to his complying with the conditions of tenure. No tenant is evicted unless he fails in his obligations as a partner in the scheme, so that all good cultivators enjoy reasonable security of tenure.

The owner still retains the title to his land and is free to dispose of it if he wishes, though to prevent any abuses only sales between natives of the region, or to the government, are sanctioned. The rate fixed for ground rent, method of allocating tenancies and conditions of tenure fitted in well with current values and traditional usage so that they were readily accepted.

* Equivalent to approximately 2s. per acre; 1 feddan equals 1.038 acres.

The partnership

When the government installed the experimental pump scheme at Tayiba in 1911 it entrusted the management to the Sudan Plantations Syndicate Ltd., which already held a cotton growing concession elsewhere in the Sudan. After due consideration in 1913 the relationship between Government, Syndicate and tenant was established on a profit sharing basis, the Government getting 40%, the tenant 40% and the Syndicate 20%. In 1927 an affiliated company, the Kassala Cotton Company, was granted part of the concession, with a slightly larger share of the profits, but otherwise functioning exactly like the Syndicate. The profit sharing partnership has been a complete success. Not only is responsibility shared, but each partner is ensured of a reward for efficiency, initiative and hard work. Each individual tenant shares in this reward, and, as the other partners accept a share in the profits in payment for the services they render him, he is relieved of a burden of expenditure which he could not bear in seasons when the crop had not been profitable.

Each partner has functions, responsibilities and obligations. The government controls and supplies land and water. Its share of the profits goes to recoup the cost of the dam, maintain the dam and system of canals, and pay ground rent. In addition the scheme's profits have helped the Government to develop its services in the Gezira and elsewhere, and start new projects in other parts of the country. The Syndicate has two main functions: the management of the agricultural side of the project and the processing and marketing of the cotton. The Syndicate, being a commercial organisation, was well fitted to undertake these duties. It served well both its partners and its shareholders.

The tenant is provided with free land, free water for cotton, grain and fodder crops, selected and treated cotton seed, and cash advances for the establishment of his cotton crop. In return for his 40% share of the profits he has to do the work and bear the expenses involved in growing his crops, has to farm and irrigate his land according to a fixed plan and maintain a reasonable standard of husbandry. The grain and fodder crops remain the property of the tenant, but the cotton crop becomes the property of all three partners.

Management and tenants

There is of necessity a close contact between management and tenant. The administrative units of the scheme ('blocks') are small enough for each block inspector to know his tenants individually and thus maintain a human relationship, which must have solved many incipient difficulties and contributed a great deal to the welfare of the tenants. The management assists the tenant in growing his crops by carrying out operations which require equipment, material or skill not available to him. Strictly the cost of these should be charged to the individual tenant who has received the service, but large scale routine operations such as mechanical ploughing are charged to the tenants' communal account and not allocated to individuals. Extra operations carried out on poor or weedy land are thus a charge on the farming community and not on the individual farmer. Experimental and other special operations are usually debited to a joint account against all three partners. Crop improvement operations such as manuring and spraying which are not done over the whole scheme are charged in this way. By these methods it is possible to carry out the amelioration of poor land and poor crops which individual tenants could not afford, and which might in itself be unprofitable.

The present position

The concession granted to the Sudan Plantations Syndicate Ltd. came to an end in 1950 and on account of the political and social advances which had taken place in the Sudan, it was decided not to renew it. The staff and assets of the Syndicate were taken over by the Sudan

(*Left*) **Regulator on the main canal** (*Right*) **The Sennar Dam on the Blue Nile**

Government, and a board of management, called the Sudan Gezira Board, was constituted. The Sudanese themselves now take a part in both the direction and running of the scheme. The tenants too have greatly increased their say in running their own affairs, through the medium of tenants' councils and other local administrative and executive bodies. These are evolutionary developments and the Government has wisely avoided any drastic changes in the technique of management developed by the Syndicate.

With the winding up of the company the profits previously paid in dividends became available to the Gezira Board. It was decided to utilise these for the social development and welfare of the inhabitants of the scheme. A welfare unit has, therefore, been formed and is sponsoring and financing the improvement of water supplies, education, nutrition and other matters of importance to a community which is rapidly becoming sophisticated.

Conclusion

This brief summary of the organisation of the Gezira scheme does not do it full justice. If interested readers are able to obtain access to the publications listed below they will obtain a much fuller appreciation of the thought, planning, and social and economic good sense which went into the organisation. It must be emphasised that crops, agricultural methods, and organisation were fully tested in the pilot schemes, and that much fundamental research preceded the opening of the full blown scheme. Undoubtedly this was one of the most potent factors contributing to the success of the scheme.

BIBLIOGRAPHY

1904 Garstin, W. E. Report on the Basin of the Upper Nile with Proposals for the Improvement of that River. Ministry of Finance, Egypt.

1917 Sudan Government. Gezira Irrigation Scheme, Report of Delegates (mainly financial).

1920 MacDonald, M. "Nile Control." Vol. 1 (Part IV). Ministry of Public Works, Egypt.

1926 Anonymous. Notes on the Gezira Irrigation Scheme. McCorquodale and Co.

1943 Gaitskell, A. Advantages of the Gezira Scheme. E. Africa and Rhodesia, Nov. 18, 1943.

1948 Tothill, J. D. "Agriculture in the Sudan." O.U.P. (particularly Chapters XXI and XXVII).

1950 Sudan Government. Select Committee of the Legislative Assembly on the Future Administration of the Gezira Scheme.

1950 British Cotton Growing Association. The Sudan Plantations Syndicate Ltd., and the Kassala Cotton Company Ltd., and their work in the Anglo-Egyptian Sudan. Reprinted from 45th Annual Report of the Association.

1950 Anonymous. The Gezira Scheme, 1950. Central Office of Information, London.

Photos: Pp. 15, 16, 17 and 18 (right), Public Relations Office, Khartoum; p. 18 (left), Gezira Information Office.

Potentialities of the Sabi Valley

Dr. Charles D. Converse, officer in charge of the Sabi Experimental Station, recently described the Sabi Valley scheme in S. Rhodesia as possibly being one of the most weighty factors in the eventual destiny of that country. 'It will cost money, time and labour and very sober thinking,' he told the National Affairs Association. 'One-fifth of your land can be included in the Sabi scheme if it is carried to its maximum development. It is proportionately far greater than any like development in reclamation in the United States.

'We are now engaged in the first stage of action—learning,' said Dr. Converse. 'In America hundreds of thousands of dollars lay in sand-filled canals and forgotten fields, broken buildings and broken people, because the planners leapt too often before they looked. Our people have seen and bitterly regretted the cost of headlong development. Even ten years' research is hardly adequate for a land as new as the Sabi.' Referring to the possibilities of beef production, he said that the King Ranch in Texas began perfecting a line of animals 30 years ago. 'They didn't work with 30 head of cows, or 300, or even 3,000 —they had 50,000 head of cattle to deal with, plus the co-operation of trained scientists.

The New Fordson Major

A short description of the new Fordson Major tractor appeared in our issue for December 1951. The tractor was officially introduced to public notice at an inaugural function held on November 21 at the Kursaal, Southend-on-Sea, where some 450 guests attended. Among those present were Sir Thomas Dugdale, British Minister of Agriculture, Lord Airedale, Lord Radnor, H.E. V. K. Krishna Menon, the Rt. Hon. Duncan Sandys, M.P., the Rt. Hon. Walter Elliot, M.P., the Rt. Hon. R. S. Hudson, M.P., Sir Patrick Laird, Sir James Turner and other notabilities.

After luncheon Sir Rowland Smith, Chairman of the Ford Motor Company, welcomed the guests, and Sir Patrick Hennessy, Vice-Chairman, briefly outlined the main features of the new model and unveiled an example of it. Replying on behalf of the guests, Sir James Turner, President of the National Farmers Union, referred to the outstanding part which the Fordson tractor had played in the mechanisation of the British farming industry and congratulated the Company on the new model.

Subsequently the party inspected a display in which the features of the new tractor were demonstrated, and the wide range of implements available for use with it were exhibited. In the course of the afternoon a film was shown illustrating the conception and development of the new model and various stages in production.

All present were greatly impressed with the form and the potentialities of the new model which seems destined to play an important part in the further development of mechanised agriculture.

The association of Ford with farming dates back to 1917, and in the Dagenham factory alone, where tractor production began in 1932, nearly half a million have been built.

FARM MACHINERY

International Flavour at Earls Court

1951 SMITHFIELD SHOW EXCELLED THE PREVIOUS YEAR'S

Below we publish an account of the third post-war Agricultural Show and Machinery Exhibition which was held at Earls Court, London, from December 3-7. The number of machines, implements and accessories was greater than ever and the standard of livestock entries, although depleted by the outbreak of foot and mouth disease in the eastern counties, was commendably high. A highlight of the show was that for the first time since the war butchers were able to bid at a public auction for the carcases of slaughtered animals and, although they had to pay six times the controlled ration price they bid willingly, if only for the satisfaction of displaying English prime beef in their windows for the Christmas shoppers.

The international flavour of the show was strong and for those who could not themselves visit London this following account will give them some picture of Britain's largest indoor agricultural show.

A corner of the machinery hall at Earls Court. Note the large crowd round the new tractor on the Fordson stand

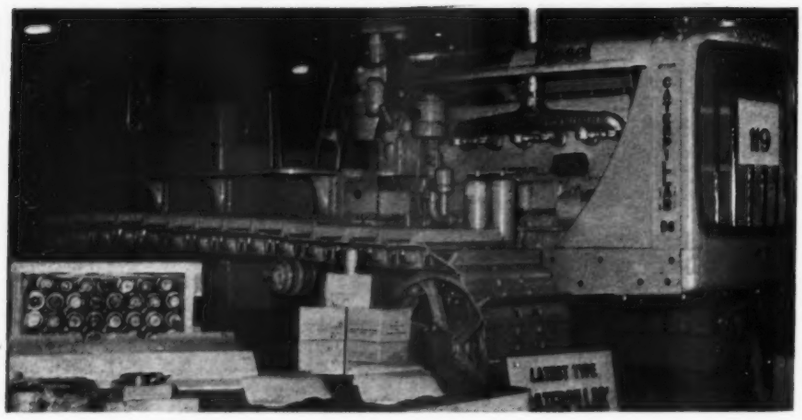
SPEAKING at a press luncheon before the opening of the 1951 Smithfield Show, Mr. H. J. Lloyd, O.B.E., Secretary of the Agricultural Engineers Association, said, ' I think you may like to be reminded of what the industry has done since 1945. In that year the value of total output was only £19 millions, of which no more than 18% was accounted for by exports. In 1950 production was valued at £84.7 million—more than 50% for export. During the first half of 1951 we topped the £50 million mark, with the export percentage rising to 53% and above.' These figures give some idea of the tremendous advances made by the agricultural engineering industry in this country since the war and the increasing popularity of the Smithfield Show each succeeding year.

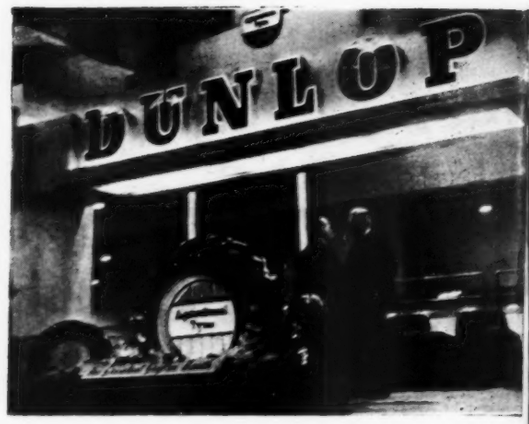
Cattle judging went on all day on the opening day of the show, watched by a critical audience

The international flavour of this third post-war Smithfield Show was more than ever in evidence this year. A record of nearly 600 overseas visitors came to Earls Court and over 20 foreign manufacturers were included in the list of exhibitors in the Trades Section.

Machinery

It was the largest show ever presented, with 564 cattle, sheep and pigs, together with 2,500 machines and items of equipment. Among the novelties to be seen were : a new mill for grinding, fitted with de-fibring apparatus, controlled by an electric brain ; a vegetable washing machine with 1,500 water jets, powered by a three-speed 15-h.p. motor ; an electric potato steamer which cooks 2 cwt. of potatoes upside down in three hours. One of the grinding mills, incidentally, was purchased by the American Government





(*Left*) **A massive Caterpillar D.6 tractor, developing 76 belt h.p. and weighing over 17,000 lb.** (*Right*) **The Dunlop stand displayed a wide variety of tyres of all shapes and sizes suitable for implements from tractors to wheelbarrows**

to be used in Washington to destroy confidential documents.

From a walk round the 370 or so trade stands one was able to notice certain trends in machinery and equipment design: for instance, tractor manufacturers are laying emphasis on track-laying models, presumably with an eye to overseas markets and large-scale farming. Similarly, the diesel engine is becoming more popular, not only for tractor engines, but also for stationary machinery.

The problem of getting the work done with a minimum of human labour is greater than ever in the U.K.—particularly since the recent wage increase of 8s. a week—and mechanical handling equipment was well to the fore ; also, ' combine ' machines —drills and fertiliser distributors, potato planters and fertiliser placement apparatus, besides combine harvesters, potato harvesters and sugar beet harvesters in greater variety than before.

Last month in WORLD CROPS we published accounts of some of the machinery which was to be seen at the show. Below we describe some more items which attracted our attention at Earls Court.

On the stands

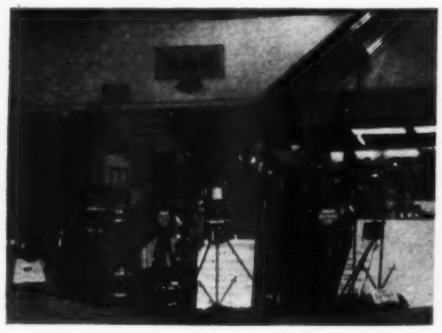
The stand which appeared to attract considerable attention was that of the **Ford Motor Co.,** on which the new Fordson Major was shown to the public for the first time. This tractor, as was described in WORLD CROPS last month, is of completely new design and is obtainable either as a diesel, vaporising oil or petrol-driven model. The costs of these three models are £627, £520 and £520 respectively, including electric starter, lighting, hydraulic lift and linkage and power take-off.

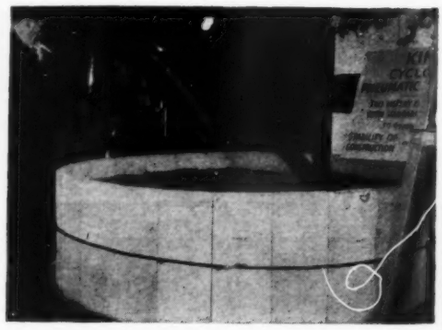
The **Turner Manufacturing Co.** showed their diesel ' Yeoman of England ' tractor, which with its 40-b.h.p. engine develops considerable pulling power for a wheeled tractor.

In the field of rotary cultivation, now becoming increasingly used both at home and abroad, **Rotary Hoes Ltd.** showed their new ' Gem ' mark 4, a twin-cylinder engine with 10-h.p. output and having three forward speeds and reverse.

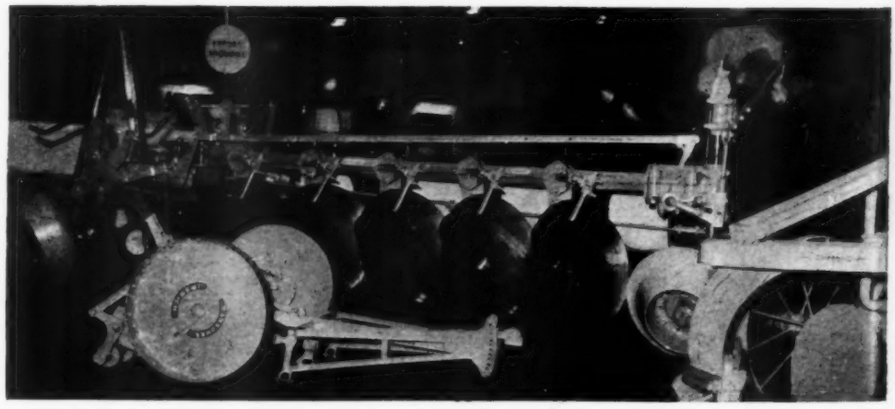
Dashwood Engineering Ltd. also showed a rotary machine which retains the main features of the Colwood garden tractor. It has an overall width of 9 in., 1.2-h.p. engine, and is priced at £78. This firm also showed a mechanised ' push hoe ' for row crop work, powered by a 98-c.c. two-stroke engine.

The field of crop-spraying machinery seems to grow larger every year and this year was no exception. Several new machines were on show. **Universal Crop**

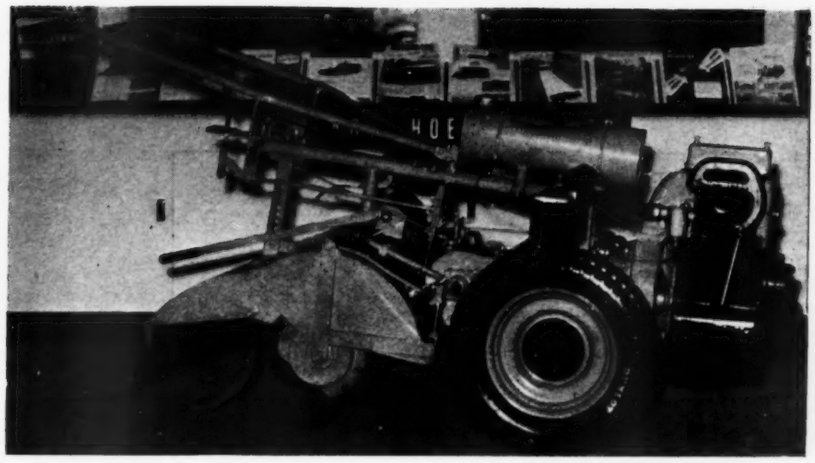




(*Left*) **An 18-ft. 'Universal' elevator dominated the stand of the Wolseley Sheep Shearing Machine Co., more commonly associated with electric fences.** (*Right*) **A cyclonic pneumatic grain conveyor in action on the stand of George W. King Ltd.**



The stand of Messrs. Ransomes, Sims & Jefferies Ltd. had, as usual, a wide range of cultivation implements



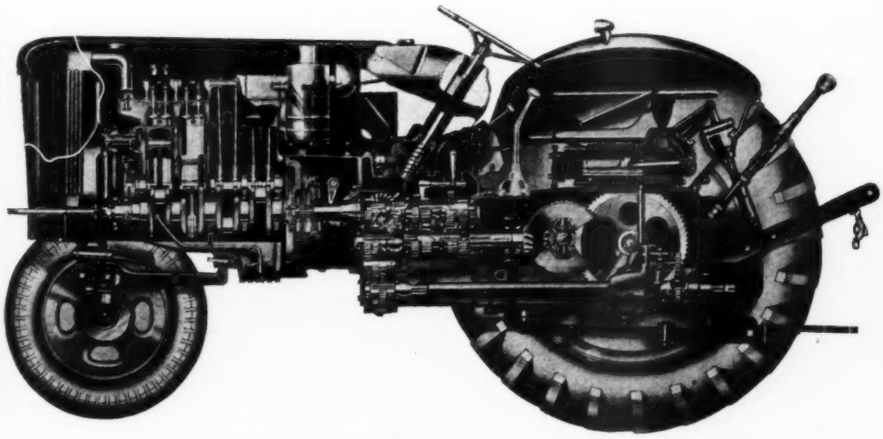
(Left) **An interested visitor clambers up the side of a seed cleaner and grader on Mitchell Colman & Co.'s stand.** *(Right)* **The new Howard Rotovator 'Gem,' series four, model with twin cylinder engine**

Protection Ltd. showed their combine dusting and spraying equipment for the first time.

A new production from **Pest Control Ltd.** is the Pestatom, which can apply wet dusting, *e.g.* a method of applying finely divided water droplets simultaneously with an insecticide or fungicide dust. It can also be used for dry dusting and wet spraying. Powered by a four-cylinder petrol engine coupled to a fan, the machine has an output of 10,000 cu. ft. per minute with an airspeed of 80 to 100 m.p.h.

A large tractor sprayer for fruit and hops with a 1,200 gal. per hour capacity was shown for the first time by **Drake and Fletcher Ltd.** With a tank capacity of 275 gal., pressure up to 600 lb. per sq. in. can be obtained and the outfit may be used for either hand or automatic spraying. Its weight is $18\frac{3}{4}$ cwt. and a 40-ft. spray boom is available.

A 120-gal. tractor-mounted sprayer, consisting of three tanks with a total capacity of 120 gal. and a spraying width of 18 ft., was shown by **E. Allman and Co.**



A sectional drawing of the new Fordson Major tractor, as described in WORLD CROPS last month

The McCormick International pick-up baler with an output of two to five bales per minute on the stand of International Harvester Company of Great Britain Ltd. The price of this machine is £645

Stationary equipment

Amongst the barn machinery much interest was shown towards a new grain conveying, drying and air heating unit, powered by diesel engine and manufactured by **George W. King Ltd.** This system ensures the complete change of air in bulk stored grain at regular intervals.

Mitchell Colman and Co. have introduced a new forage blower with an impeller-type fan fed by an auger screw which, it is claimed, will convey chopped materials such as grass, sugar beet tops, etc., to a height of 60 ft. Two models are made, the chassis of one of them being built on wheels, and it is evident that more and more farm machinery is now being made mobile in this way.

Stock entries

In spite of the epidemic of foot and mouth disease which had broken out in the eastern counties, over a third of the cattle entries arrived at Earls Court (117 out of 317). Cattle breeds included Devon, Hereford, Shorthorn, Aberdeen Angus, Sussex, Red Poll, Galloway, Welsh, Highland, Lincoln Red, Dairy Shorthorn,

South Devon, British Freisians, cross-breeds and Dexters.

Scottish breeds on the whole had a successful time ; three Galloway steers won the inter-breed championship, with Aberdeen Angus second. The restriction in the movements of cattle weakened entries of most breeds and results might have been different had not foot and mouth disease intervened. Twenty-three breeds of sheep were entered and 9 of pigs ; 279 sheep arrived at the show (out of 465 entries) and 168 pigs (out of 440 entries), swine fever being partially responsible for the drop in pig numbers.

The winner of the King's Perpetual Challenge Cup for the best beast in the show bred by the exhibitor (except in the carcase competition) was a two-year-old Aberdeen Angus steer from Banffshire, Scotland ; the reserve was an Aberdeen Angus x Shorthorn heifer, just under three years old, from Perthshire.

The champion prize for the best pen of sheep in the show went to three fat lambs from Glencrase, Perthshire ; these were Border Leicester x Suffolk crosses. The reserve went to a pen of thee fat yearling wethers from Meigle in Perthshire.

Pest Control Ltd.'s triple-purpose machine, the 'Pestatom,' for applying insecticides and fungicides in wet or dry form

The champion plate for the best single pig went to a Large White, aged five months and four weeks, bred in Hampshire. The reserve was a five months and two weeks old Tamworth x Large White cross.

Attendance

The show was well attended and for the third year in succession a record post-war attendance of 66,000 was recorded (49,000 in 1950). For visitors from overseas there was a special lounge and, in addition, a reception office at the main entrance where they were welcomed to the show and supplied with any information needed. These visitors came from most parts of the world. For instance, the visitors' book at the overseas reception at two o'clock one afternoon showed entries from Argentina, Australia, Canada, Eire, Finland, France, Germany, Holland, Israel, Jamaica, New Zealand, South Africa, Spain and Tasmania, which included government officials, agricultural officers, overseas dealers and agents. The organisers of the Paris agricultural machinery show expressed their admiration of the layout and the general organisation of the exhibition. Among many others was Mr. Weerasuruja, an agricultural officer from Ceylon, who was particularly interested in the potentialities of rotary cultivation in paddy fields. The number of visitors from South America, particularly Argentina, was larger than usual.

Agricultural Research in the British Colonial Dependencies

THE sixth annual report* of the Colonial Agricultural Research Committee provides a summary of the main research activities in agriculture and related subjects in the British Colonial Dependencies for the year 1950-51.

The Committee forms part of the general organisation set up for the co-ordination and development of all aspects of research in the British Colonies under the Colonial Research Committee. It is, however, a separate entity with specially defined functions and is linked to the Colonial Advisory Council on Agriculture, Animal Health and Forestry, which deals with other aspects of agriculture in the Colonies. Its work is also related to that of the Colonial Products Research Council which deals *inter alia* with the processing of agricultural products and research on new uses for them. Associated with it are three standing subcommittees dealing with research on cocoa, soils and stored products.

The chairman of the committee is Dr. Norman C. Wright, scientific adviser to the British Ministry of Food, and its membership includes such well-known scientists as Sir Edward Salisbury, Sir W. Ogg, Sir John Simonsen, Sir Frank Engledow, Sir Geoffrey Clay, Sir William Slater, Sir Raymond Priestley, Professor H. G. Champion, Professor W. Beveridge, Professor J. W. Munro and Dr. G. D. H. Bell.

The report includes an introductory section and four other sections dealing respectively with regional agricultural research, individual research funds, research carried out by Colonial agricultural, veterinary and forest departments, and the work of its standing subcommittees.

From it we learn that owing to the heavy commitments on research a sum of £1,300,000 was allocated from available balances under Colonial research funds for research in agriculture, animal health and forestry, and that the committee has considered priorities to be assigned to expenditure on certain research schemes.

We also learn that 13 schemes which received aid under the Marshall Aid technical assistance plan have been approved, three of which have been successfully completed while nine await the recruitment of suitable personnel.

Of regional schemes the progress of the East African Agricultural and Forestry Research Organisation has already been reviewed separately in this journal. Buildings for the corresponding Veterinary Organisation will, it is anticipated, be constructed during 1952; it will when completed and fully staffed carry out long-term investigations for both East and West Africa.

A survey has been initiated to ascertain how far it is desirable to establish a similar Agricultural and Forestry Research Organisation for West Africa. Provision has been made for the finance and continued operation during the next three years of the Oil Palm Research Station at Benin with the aid of a grant from the Palm Oil Marketing Board. It was founded originally in 1938 and since then it has been considerably enlarged and extended with assistance from Colonial research funds.

The Cocoa Research Institute at Tafo in the Gold Coast has continued its work. It was founded in 1944 and is now financed by funds provided by the Cocoa Marketing Board.

In the West Indies research at the Imperial College of Tropical Agriculture includes work on cocoa, sugar cane, bananas and soils. It was given a new impetus as a result of recommendations by Sir G. Clay following a recent visit.

The report contains brief accounts of new projects for research in a number of dependencies, including Northern Rhodesia, British Honduras and the East and West African Dependencies as well as for work on a number of general problems.

*Sixth Annual Report of the Committee for Colonial Agricultural, Animal Health and Forestry Research. H.M.S.O., 1951.

Some Agricultural Problems of Pakistan

S. J. WRIGHT, M.A.

Agricultural Adviser to the Ford Motor Company

At a recent joint meeting of the India, Pakistan and Burma section of the East Indian Association with the Royal Society of Arts, a paper bearing the above title was delivered. Below is a shortened version, reproduced by permission of the R.S.A.

ONE problem of recognised importance in Pakistan, as in so many other countries both in and outside Asia, is to raise the standard of living of the ordinary man. The solution of this problem involves many others, including power supplies, communications, and industrial development—in all of which Pakistan has laid bold plans and made, already, remarkable progress. But in a country in which something like 90% of the population live on or by the soil, and in which both the main exports and the main raw materials for industry come from the land, the main kernel of the solution must lie in raising the level of agricultural production. What Pakistan's farming accomplishes already should by no means be belittled. She is one of the few thickly-populated countries in the world that manages to feed her own people. She exports wheat and, last year, was able even to export some of the rice that is so vital to Eastern peoples. But her economy depends so largely on agriculture that, in a competitive world, still greater accomplishments are needed.

Mechanisation objects

In Pakistan, where to displace rural labour, over-abundant though it may be, is the last thing that anyone wants to do—and where, for good reasons, the cultivated area cannot be greatly increased—it is to raise yields that mechanisation must be applied, if it is to be applied at all.

Pakistan yields are low by almost any standard: even with irrigation, for example, they grow rather less wheat on three acres than we commonly do on one. This is a familiar enough feature of other countries devoted to small-scale peasant farming; and, as is well known, the causes are many and complicated. Prominent among them, in most such areas, are things like failure to use good seed, failure to maintain soil fertility or texture, failure, in a word, to practise what we call good husbandry. But in the face of long-established custom these things have proved difficult to change. The benefits of change will seldom be immediately obvious to the people concerned; and, on the very occasion that should prove convincing, may be wiped out altogether by some accident of season. Moreover, what *is* good husbandry for these countries has, very often, still to be worked out. It is in these circumstances, and without in any way diminishing the importance of other factors, that it is suggested that some degree of mechanisation may offer a more immediate way out.

Pakistan has over 50 million acres of cultivated land and, simply from this standpoint, is nearly as big as Canada. As we have heard already, her agriculture feeds the whole population of over 80 millions, the two main food crops being wheat and rice. It also provides, in the shape of jute, cotton, tea and hides, most of what is exported, as well as the main raw materials on which new industries will be based. The country is in two parts which, in their agriculture, are very different from one another. West Pakistan, with a rainfall which is negligible in some parts, and rarely exceeds 12 in. anywhere, is a dry area in which crop production largely depends on irrigation. But East Bengal—a thousand miles away on the other side of the subcontinent—with an annual rainfall of over 100 in., must be one of the wettest farming areas in the world. It is here that all the jute and most of the rice are grown, both crops thriving under flood conditions. But the population of East Bengal is so dense that even 18 million acres of rice are barely enough, and some has generally to be bought from farther west.

The whole country is devoted to what, by our standards, is very small-scale farming. In West Pakistan the average holding of a cultivator and his family is only 8 or 9 acres; in East Bengal it is smaller still—probably no more than 3 acres. An added difficulty, in many areas, is the 'fragmentation' that comes from the practice of dividing all heritable land equally between the sons of a deceased land-holder. Because of this, even a 3-acre holding may be in half a dozen separate pieces, with parts of other holdings in between.

For such work as is not done by hand, draught animals—nearly always oxen of one kind or another—are the only source of power. And since, later on, I may be critical of their performance as farm power units, I should recognise immediately that Pakistan draught animals fill many other roles as well: they tread out all the corn and transport all the produce; they provide milk on nearly every holding; and their dung is the main, and sometimes the only, fuel of the countryside.

The epitome of Pakistan agriculture; the peasant cultivator with his ox-drawn wooden plough

Irrigation

The lifeblood of West Pakistan farming comes from her five rivers: the Sutlej, the Ravi, the Chenab, the Jhelum—with the Indus into which they flow. In among the four tributaries, mainly in what is called the Colony area of the Punjab, is one great network of irrigation canals, while lower down—spreading out from the Indus into the Province of Sind—is another, nearly as large, and destined one day to be larger. Some smaller irrigation areas are served by tube wells, while elsewhere crops are grown, wherever they can be, with the aid of natural rainfall alone. But it is from the main canal zones that the greater part of all crop production comes.

The most productive land is that served by perennial canals, from which water can be taken all the year round. On this land, both winter and summer crops can be grown, by far the most common ones being wheat in winter and cotton in summer. Irrigation water is rationed so that each holding gets a definite volume in proportion to its size. The ration varies with district and with season, but generally allows each cultivator to plant one third of his holding with a winter crop, and a quarter of it with a summer crop, the remainder lying fallow. Payment for water is made on a crop acreage basis, so that if a man chose to plant more than his due share of one particular crop, he would have to pay more for the same volume of water, and also take the risk that it might not be sufficient. The method of distribution is that the outfalls from the watercourses are opened at intervals to give a definite rate of discharge for a definite length of time. The rest is up to the individual cultivator. He must see that his own ditches are in good shape to receive and convey the water, and must do whatever may be necessary during the watering to control or divert the flow. The intervals are generally arranged so that the land is watered just before ploughing and planting, and on two or three other occasions between then and harvest. In and near the main canal areas are others, served by non-perennial—or inundation—canals, which provide water only while the rivers are in flood. These are used mainly to flood surrounding land for rice growing. In addition to what is consumed in West Pakistan, inundation areas provide the extra rice necessary for East Bengal.

Including the areas served by tube wells, just about half of West Pakistan's tillage land is irrigated. The remainder depends entirely on natural rainfall, and can grow only winter crops for which the land must be ploughed and planted immediately after the rains. Where rains are likely to be plentiful, wheat is the main crop. Elsewhere the main crops are millet or gram—a leguminous crop needing relatively little water—of which the seed is used for both human and animal consumption. But yields of rain-fed crops are light and uncertain, because the rains themselves are uncertain, and because, even following good rains, there is little enough time to get the ploughing and planting done while the soil is in fit condition. Any method of faster working would make crop production more certain, and might extend the area cultivated.

Threshing, one of the primitive processes carried out during harvest in the Punjab

Farm sizes

West Pakistan farming is very commonly based on share cropping. The exact arrangement varies with the district but, usually, the tenant cultivator retains half of the produce of all the main crops while the zamindar, or landlord, takes the other half. The zamindar provides the land and pays all dues and taxes arising from it, including charges for irrigation water. The tenant, for his part, provides a pair of oxen, with their implements, together with seed and fertiliser, and, with his family, is responsible for cultivating, irrigating and harvesting all the crops. The tenant also gets land and water for small areas of fodder crops for his oxen, and vegetable crops for himself and his family. Whatever the size of the zamindar's estate—and they vary all the way from tens to tens of thousands of acres—the tenant's holding is limited to the area that can be worked with one pair of oxen.

With holdings as small as this, individual fields are necessarily very small indeed. In the Punjab, where the 2½-acre squares make a fairly definite pattern, the individual tenant's half square is divided by irrigation ditches into five 2*x*-acre ' fields.' Each of these has a ' bund ' or bank down the centre, so that the two halves can be irrigated separately from the ditches alongside. The unit area for cultivation and cropping, therefore, is a rather narrow rectangular plot of a little over an acre. In contrast with this, the common practice in Sind is to arrange all the cotton land of an estate in one compact block, all the wheat land in a second block and all the fallow land in a third. Every year these blocks are parcelled out so that each tenant get 6 to 8 acres of cotton land and 8 to 10 acres of wheat land. But the blocks are rotated year by year over the whole estate, so that the actual portions cropped by individual tenants are constantly varying. Under this system, all preparation of the land for planting could be done with the whole wheat or cotton block as the unit area. Outside these two areas there is no general pattern beyond that of an irregular chequer-board, in which some fields are of reasonable size, while some are as small as tennis courts.

Cultivation methods

To Western eyes, Pakistan's methods of cultivation appear primitive in the extreme. The land is scratched, rather than ploughed, with an implement of which the operative part is no more than a wooden point tipped with iron. The scratching, or

Harvest time in the Punjab

ploughing as it is called, is repeated, and repeated again. The cultivators of one West Pakistan district were criticised because they ploughed only three times in preparation for a cotton crop, while in East Bengal seven ploughings for jute were commonly mentioned as being the ideal. I doubt whether there is much virtue in the separate workings except that, in one passage, the scratch-plough accomplishes so little. Following the ploughing, the land is smoothed and levelled with a sohaga pulled by two pairs of oxen working abreast. This is just a heavy plank of wood—and the fact that it needs four oxen to pull it is probably one of the reasons why, in the Punjab, tenant holdings are arranged in pairs. On some farms wheat is sown with a primitive-looking, but possibly quite effective, four-row drill made entirely of wood; while cotton seed is dribbled by hand down a spout attached to the plough. But on most farms, seeds of all kinds are broadcast by hand. It is worth noting that, unfamiliar though these methods of working may appear, they really differ only in time from our own. An almost identical scratching plough must have been common enough in Britain at about the time of the Roman Conquest, and may well have earned unfavourable comment from generals who had come from the eastern parts of their empire. It might be concluded from this that present Pakistan methods are not so closely bound up with local circumstances of soil or climate that they cannot be changed.

Between planting and harvest the fields are weeded, either literally by hand, or with the same hand tool—resembling a broad-bladed mattock—as is used for all the ditch-digging, bank-building and channel-making that must be done in irrigation. Finally, the crops are harvested by hand, threshed by treading with oxen, and winnowed by throwing the trodden debris into the wind.

Ploughing

The weakest link in this whole chain of events is, obviously, the ploughing. With the implement now used the work is slow, and by no means thoroughly done. In East Bengal it commonly takes 12 man-days to plough an acre of land for autumn rice; and up to 17 man-days to plough an acre for jute.

The benefits of faster working would probably be great and far-reaching. This would certainly be so in rain-fed cultivation, where the ability to plant more quickly would extend the area cropped in most seasons, and give greater certainty of an adequate return. With tractors the main work is done when it should be and, because it is out of the way, there is more time and energy for after-cultivations. Again, with faster working, between-seasons irrigation water can be used to better advantage. With what water is available between the last irrigation of the cotton crop and the planting of the wheat crop green crops could be grown to be ploughed in and improve the soil. There is a direct gain, too, through less water being used to grow fodder for oxen.

As regards the thoroughness of the ploughing, I was told everywhere that to cut all the land and turn the soil over—as any modern plough does, or as even our 17th century wooden plough did—would bring all-round improvement. In the Punjab I was shown an improved local plough—with the beginnings of a wedge shape in its wooden point and slightly more iron on the tip—which went some way, though not very far, in the right direction. It had been known as a better plough for long enough, but all efforts to popularise it had failed, because it could only be used where there were improved oxen.

Examples like this served only to confirm the one main impression that I got from all that I saw and heard in Pakistan: that the draught animal is one of the main factors limiting the productivity of the farming. The traditional pair of oxen controls the size of holding, checks the development of better equipment and, at least in rain-fed areas, limits the area cropped; and my conclusion was that, sooner or later, Pakistan must get rid of them.

In theory much might be accomplished by introducing better animal-drawn tools, with better animals to draw them. But the hot climate itself is probably the basic reason why the capacity of Eastern draught animals is so much lower than that of Western ones; while even if this were not so, how many generations would it take to breed and popularise stronger ones? It would be equally difficult and, in a widely-scattered and largely illiterate community, might take even longer, to bring about general recognition of any of the other improvements in farm practice tha. any experienced agriculturist could recommend. I can well imagine, for example, how reluctant a small farmer would be to find money, or to pledge part of his crop in payment, for better seed, instead of sowing, as he had always done before, what he had saved from his own harvest. He would see no immediate return for his money and, because of all that might happen in the meantime, might never do so in an unfavourable year. But if the same man saw his neighbour complete in one day what would involve him in another nine or ten days' toil, I think he would soon be impressed. And if his neighbour then offered to do the same for him at a cost no greater than the cost of what he ordinarily does with his own oxen, I think he would probably jump at the opportunity. Moreover, following such an experience, he might be readier in the next year to listen to his neighbour's views on better seed or something else. Nor, as regards cost, is this an entirely fanciful idea. A recent Pakistan estimate, based solely on family costs of subsistence, puts the cost of a man's work at about 1 rupee

12 annas per day, and that of a bullock at 1 rupee. This would bring the average cost of ploughing an acre by present methods to something like 38 rupees—or a little more than £4. It would have to be quite exceptional ploughing to cost as much in Britain. It may seem curious in a country which tends to regard a 5-acre field as something of a hindrance to mechanisation, to be advocating its trial in fields only a quarter as big; but the standard of comparison—with our horses in the one case, and Pakistan oxen in the other—is quite different. Moreover, anyone who thinks that an ox team is handier than a tractor for a small area should go and see for himself. I saw modern tractors with mounted implements working alongside oxen, and they looked much as ballet dancers would alongside heavy-footed policemen.

A typical mud hut in Eastern Pakistan

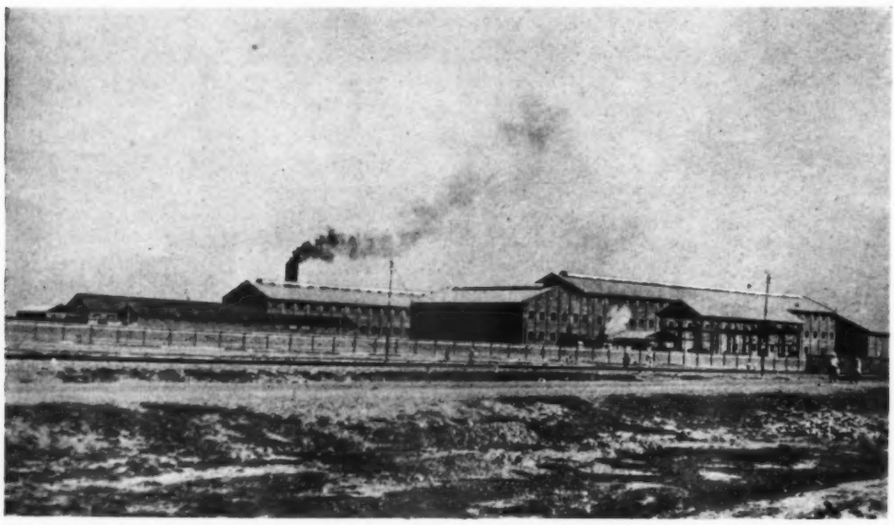
Amount of mechanisation

I am, of course, not advocating anything like what we should call complete mechanisation. I have only mentioned ploughing so far, but wherever tractors are used for this, they are likely to be used also for harrowing or levelling the land, and for seed-sowing. For one thing, unless this is done, the number of oxen needed will be hardly reduced at all, so that nothing like the full economy of mechanical power will be realised. For another, wherever greater timeliness is among the advantages to be gained, it is the sowing of the seed that needs to be rightly timed. But in a country in which there is abundant labour, and practically no risk of losses through bad weather, to attempt to mechanise crop harvesting would be ridiculous; nor is there need to mechanise the hand work in between.

If the potential advantages of mechanical power in cultivation are accepted, the difficulties of realising them in Pakistan should not in any way be minimised. Where the man who actually tills the soil has only a few acres, only the co-operative use of equipment can bring widespread progress. One form of this is the provision of estate equipment by the more enlightened samindars; though how many there are, or what proportion of the country they would represent, is quite unknown. Probably the most fruitful line of advance would be the establishment of what we should call farmer-contractors: the man who has more equipment than he needs for his own holding—and any Pakistan tenant with a tractor would be in this position—and who uses its surplus capacity to do work for his neighbours.

Another difficulty, not on any account to be under-estimated, will arise from an almost complete lack of machinery-mindedness in the rural population. But I saw nothing to suggest that a Pakistan peasant would not learn as readily as anyone else, if he was convinced that his pocket would benefit; and I see no reason why a bold enough educational plan should not remove the difficulty altogether.

Photos: Pakistan Information Office, London.



Pakistan's largest jute mill

Our Contemporaries

A selection of articles appearing in the January issues of some of our sister journals in the Leonard Hill Technical Group is given below:

Food Manufacture: 'The Milling Industry' by A. J. Amos.

Manufacturing Chemist: 'Chemical weed Control' by Dr. W. O. Templeman; Progress Reports on Fertilisers and Plant Nutrients.

International Chemical Engineering: Rubber and Allied Products in Chemical Engineering.

Petroleum: Phase Behaviour of Lubricating Greases.

Muckshifter and Public Works Digest: 'Earthmover Tyres' by Noel D. Green.

Building Digest: Ministry's advice to local authorities on new small housing.

Pottery and Glass: Recent Scandinavian pottery, as shown at the exhibition held at the Tea Centre.

Textile Industries and Fibres: 'Ductile Properties of Textile Fibres', by A. J. Hall, B.Sc.

NEW BOOKS

Four Thousand Million Mouths

Edited by F. le Gros Clark and N. W. Pirie. Pp. 222. Oxford University Press, London (Geoffrey Cumberlege), 1951. 12s. 6d.

The problem of expanding world populations and the prospects of providing food supplies sufficient to meet their needs is the basic theme of this collection of essays by various scientific specialists of acknowledged authority. The aim is to discuss and describe the scientists' approach to the problem from the various specialised angles with which they are respectively concerned and to present an outline of their conclusions in terms which can be readily understood by the general reader.

Throughout all the essays there is the implicit conviction—in the words of Professor H. D. Kay, one of the contributors to this symposium, ' that along with the organised application of modern knowledge to agricultural practice . . . there must also be an equally conscious and deliberate dissemination and practice of modern methods for the peaceful control of population growth. Otherwise improved agricultural yields and better distribution can only stave off for a limited period the day on which unchecked human reproduction will end in war, famine and the complete breakdown of society.'

Food production can probably be expanded more rapidly than fecundity can be controlled, but this would be of small avail if during the next century world populations expand to 4,000 millions—as they will do if present trends are maintained, and at the end of that time they are as precariously fed as they are at present and are still expanding.

Obviously, if this disastrous end is to be avoided the ordinary people of the world must be educated to full appreciation of the dangers and the limitations of the possibilities, since only in this way can salvation be found. This book must therefore be regarded as a contribution to this educative process. As such it is worthy of careful perusal by all intelligent persons.

The essays in the book number 12 in all; they are written by 13 scientists and include such well-known names as Mr. F. le Gros Clark, who with Mr. Pirie is responsible for editing the volume, Messrs. F. C. Bawden, J. Hammond, H. D. Kay, F. Yates, G. V. Jacks, C. E. Lucas, Professor S. C. Harland, G. E. Reay, A. L. Bacharach and T. Crosbie-Walsh. They cover a wide variety of topics, including the raising of agricultural yields by improving crop varieties, the use of manures, conservation of the soil, control of diseases, improvement of animal husbandry, development of fisheries and marine products, elimination of waste and the preservation of food.

The standard is uniformly high; it would be invidious to particularise, but the essays by Mr. le Gros Clark on the Malthusian Heritage, by Professor Kay on Milk Supplies, by Dr. John Hammond on the Pig as a Food Producer, by Mr. C. E. Lucas on Harvesting the Waters, and by Mr. Pirie on the Circumvention of Waste struck the reviewer as particularly thought-stimulating. A somewhat curious omission is the absence of any account of the possibilities of waste elimination by the control of damage by insects and fungi to stored food products which has been so much emphasised by the work of Professor Munro and the staff of the Pest Infestation Laboratory at Slough under Dr. Herford. If, as seems likely, a further edition of the book should be called for in the future, this omission might well be rectified.

H.T.

Hosier's Farming System

By A. J. Hosier, O.B.E., LL.D., and F. H. Hosier, M.A. Pp. 244, illustrated, Crosby Lockwood, London, 1951. 21s.

The name of A. J. Hosier, that rugged individualist of British farming, is well known to most readers in the U.K. and overseas. Last year, as a fitting reward to his pioneering and inventive genius he was awarded an Honorary Doctorate of Law by Cambridge University, together with other notable British Agriculturists. Now, at long last, Mr. Hosier, with the help of one of his sons, has told his story—almost a lifetime of agriculture and agriculture engineering.

Hosier's name is synonymous with bail milking, but there are plenty of other implements of Hosier invention and adaptation described in this book.

Mr. Hosier started the hard way with little or no capital, and by adaptation and sheer hard work managed to pass through early periods of agricultural depression. It was not until 1922 that he embarked, with very little labour, on dairying, and evolved the then revolutionary idea of bringing the cow shed to the cows instead of the opposite and more orthodox system. From that day to this the general design of the portable bail has altered little. The saving of labour was obvious, and the system also ensured that all available manure went straight back on to the land—this, in many cases, on outlying pastures which would not otherwise have received the dung cart. The health of the cows was better than if they had been kept under cover, outwintering making them extremely resistant to disease.

During the last 35 years much reclamation work has been done on Hosier's Wiltshire farms; principally the clearing of scrub from downland and enlarging fields by removal of hedges and open ditches. This work entailed the adaptation of available equipment into Heath Robinson-like but effective tools for the job. Since the war much has been done in this regard with ex-War Department and Government surplus equipment.

Today Hosier farms around 11,000 acres with a staff of 75; besides the farms there is also the firm, Hosier's Inventions Ltd., which manufactures machinery. The growth of this business has developed mainly from the practical outlook of Mr. Hosier, who has approached problems with a practical and inventive mind, having, as he says, never the slightest confidence in the promises and intentions of Governments or of politicians.

The very last paragraph of this book gives some idea of the severely practical and self-reliant outlook of a man who has ploughed a sometimes lonely furrow as is wont to happen to those who are ahead of their time; he says, ' I am an individualist to the core and I maintain that business is generally more successful when managed by a dictator rather than by a committee.'

This is a farmer's book from which much can be learnt, and provides stimulating reading in this age of controls and frustrations.

R.G.P.

Introducing the Farm Tractor

By A. J. Coppen and P. H. Southwell. Pp. 30, illustrated. Technical Book No. 1, Temple Press, London, 1951. 2s.

Mr. Southwell, joint producer of this booklet, will be familiar to readers as a regular contributor to WORLD CROPS. Here, the workings of the tractor are simply explained with many coloured diagrams, the book being intended to provide a firm basis of essential knowledge on this subject. Starting with combustion in the cylinder, the processes of power-transference is followed through to the wheels, including spark ignition, the crankshaft, valve gear, carburettor, magneto, governor, lubrication and cooling, clutch and gearing.

Besides this the common means of tapping off power in the transmission are described; belt-pulley, power take-off shaft and hydraulic lift.

The coloured diagrams are clearly laid out and form the main part of the publication.

Rothamsted Report for 1950

Pp. 184. Obtainable from the Secretary, Rothamsted Experimental Station, Harpenden, Herts, England, 1951. 7s. 6d.

As usual the latest Rothamsted Report consists of a series of departmental progress accounts and after these there are two special reviews and finally abstracts of papers or articles published from Rothamsted during the year. There is much to be said for this system of presentation. The highly specialised reader can, after all, obtain detailed information about this or that aspect of Rothamsted work from the appropriate journals of agricultural science and for this the abstracts of individual papers will be a sufficient guide to him. Research station reports should aim at the more general reader and the broader departmental accounts of progress fulfil this function admirably while at the same time they spotlight the main trends of advance. It is a *table d'hote* menu but with *à la carte* diversity and generosity.

The name of Rothamsted is so traditionally identified with fertiliser research that many agricultural students, particularly those abroad, may be unaware that today this is only one aspect of Rothamsted investigations. Soil microbiology, pedology, botany, plant pathology, insecticides and fungicides, entomology, all these fields are covered by specialised departments together with one highly specialised department that devotes all its attention to bees. The fervent 'Mother Nature' schools of opinion have often selected Rothamsted as a token target for criticism, contending that plant growth research is unilaterally conducted by chemists and that the 'biological' features of soils and crops are ignored. Nothing could be more misleading. For picturesque accounts of biological factors in agriculture the literature of the 'Mother Nature' school is both unrivalled and unreliable; but genuine students will find that the annual Rothamsted Reports abound with objective accounts of investigations on such subjects as micro-organisms, mycorrhizal fungi, earthworms, and bees. Let no one suppose that at Rothamsted chemists work in single-minded or autocratic isolation.

The insecticides and fungicides department has continued to study the effect of particle size upon insect toxicity, a development which has now been strongly pressed by Rothamsted for several years. It is established with certainty that contact toxicity is related to particle size because this factor affects the poison's capacity to penetrate an insect cuticle. An interesting field result is a comparison of parathion, HETP, nicotine, and DDT as controls for bean aphis on field beans. Of the four parathion was the most effective with HETP and nicotine a little less effective though satisfactory; but DDT considerably increased the bean aphis population upon the crop, especially two weeks and two months after application. After two months there was a 400% increase in the number of aphid colonies following the DDT application. This exceedingly negative consequence is due to the fact that DDT, though toxic to the bean aphis to some extent, is far more toxic to the predators of this pest.

The chemistry department has studied the effectiveness of urea-formaldehyde materials and of formalised casein (a waste from the plastics industry) as nitrogenous fertilisers. For pot experiments of several kinds a slowly and steadily available nitrogen supplier is required and previous work at Rothamand elsewhere had shown that customary organic materials like hoof and/or horn are, in fact, exceedingly variable in their rates of availability. The formalised casein was found to be outstandingly successful, acting with both initial rapidity and steady long-term reliability. Urea-formaldehyde condensation products, far from being too slow as some American reports have suggested, were rapid and more short-lived in their effects. In a somewhat similar vein of research, attempts were made to slow down the rate of action of hoof by pre-treatment with formaldehyde, copper salts, or nitrous acid; the slow liberation of nitrogen thus induced was so satisfactory that the 1950 experiments had to be continued into 1951. Thus, there may be a real possibility of standardising the rates of availability of specialised nitrogenous fertilisers; though it still remains to be shown whether the slowing of nutrient liberation does not also bring incomplete liberation finally.

The two special reviews deal with the potato root eelworm (by Dr. B. G. Peters) and results of fertiliser practice surveys (by B. M. Church). The latter subject will interest English readers particularly for its accounts of local or regional variations in fertiliser usage. An outstanding weakness of English practice is the failure to fertilise kale. As much as 66% of kale crops in some areas receive no nitrogen, the plant-food to which this crop responds so impressively. It is surely a tragically serious 'blind spot' in applied agricultural science that our farmers withhold nitrogen from just those crops which (a) respond most to it and (b) are needed to feed cattle. Kale is more neglected than grassland was two or three years ago. Is it because an investment in fertilisers is more speedily recovered with interest when 'cash' crops are grown than when the crops are intended for the farm's animal stock?

The survey of the potato root eelworm emphasises the growing seriousness of this pest; comparatively a newcomer it has developed its hold in our soils through non-rotational potato growing in both world wars, and in addition it causes severe losses to tomato growers. Hopes that modern soil fumigants or soil insecticides can control this pest in the field are not greatly encouraged in this report. DD injections produce variable 'kills,' but even where high eelworm mortality has resulted there is a subsequent increase in eelworm population that nullifies this initial gain.

These items are, of course, only a few of the many contributions to agricultural knowledge to be found in this Report. It is not a reviewer's task to stimulate its distribution for Rothamsted, like good wine, certainly needs no bush.

D.P.H.

TO AUTHORS AND READERS

The Editor and Publishers of WORLD CROPS will be glad to consider manuscripts of books for publication. We already publish a number of books on technical subjects, all of which find a world sale, and most call for regular reprints and new editions.

Books of non-fictional type in any language by any publisher can be supplied by the Book Department of WORLD CROPS.

Laboratory Equipment

Pp. 838, illustrated. Volume I, General Section, 12th edition. Catalogue of A. Gallenkamp and Co. Ltd.

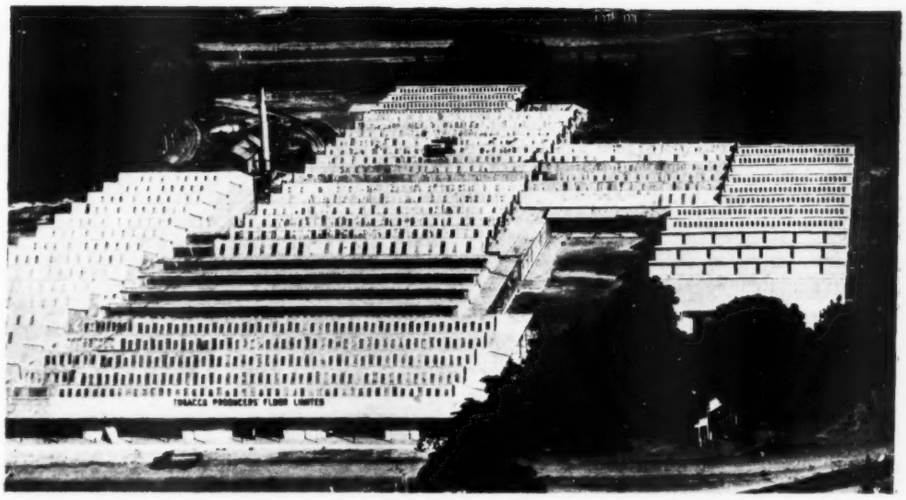
This 12th edition catalogue, Volume 1, General Section, supersedes the General Section of the 11th edition which was circulated in 1939. It is a comprehensive index of laboratory fittings and apparatus, glasswear, micro-chemical and electrical apparatus, equipment for radio-isotope applications and laboratory chemicals and reagents.

Since the last edition much of the listed apparatus has been redesigned and specifications have been revised by such bodies as the British Standards Institution, and the British Laboratory Ware Association. Thus, this up-to-date catalogue will be of real practical use to laboratories everywhere.

Executives wishing to obtain copies of this volume should apply to A. Gallenkamp and Co. Ltd., 17-29 Sun Street, London, E.C.2.

Tobacco — The Current Situation

WORLD production of tobacco in 1950/51 increased about 3% from 1949/50 and exceeded the pre-war average by 15%, but was slightly below the post-war average. Production of flue-cured tobacco, the major cigarette leaf type, continued its expansion with a 7% increase over 1949/50 and accounted for approximately 28% of all tobacco leaf. Production of oriental tobacco declined.



These extensive buildings in Salisbury, Southern Rhodesia, house the auction floors for Rhodesian tobacco

Exporting countries

Of the major producing and exporting countries, the U.S.A. had a 3% increase in total production over 1949 in spite of a slight decline in area. The output of flue-cured rose 13%. Production of fire-cured and dark air-cured each decreased by 20% and Burley by 11%. Total production in Canada, Brazil, S. Rhodesia, the Union of S. Africa and Turkey declined, mainly because of lower yields. Greece and the Philippine Republic, where the area had been considerably expanded, showed some increases. Flue-cured production increased in India, Pakistan and Japan, but declined in S. Rhodesia, where an expected crop of 54,000 to 59,000 tons was reduced to 40,000 tons by failure of the rains.

Exports from the U.S.A. declined in 1950 in spite of continued E.C.A. financial assistance to various countries, but exports of flue-cured and Burley types were not affected. Other major exporters, S. Rhodesia, India, Indonesia and Brazil, exported more than in 1949, though Greece and Turkey had a decline in exports. Generally, the difficulties in marketing Oriental types continued.

Importing countries

Of the major importers, the United Kingdom took about the same volume in 1950 as in 1949, but imports from the U.S.A. continued to decline even for flue-cured, and the percentage supplied by S. Rhodesia, India, and Canada increased considerably. The U.S.A., however, still supplied 47% of the total. Western Germany ran second in total imports of unmanufactured tobacco. The U.S.A. supplied about 50% and the Latin American countries expanded their sales in this important post-war market. The total of European imports declined slightly but except for the great decline in the French imports, particularly from the U.S.A., and the substantial increase in Spanish and Scandinavian imports, changes were small compared with 1949. In the Far East an exceptional increase in imports of raw leaves to the Philippine Republic has been noticed in 1950, but imports of finished tobacco products decreased. Raw leaf was on the free import list until mid-1950.

Tobacco in a large U.S. warehouse ready for auction after ageing process has been completed

U.S. auction prices in the 1950/51 season up to early 1951 exceeded prices for the previous season by 16% for flue-cured types and by 6% to 7% for Burley and fire-cured tobacco. During the first two months of the S. Rhodesian 1951 season which opened in April, the average auction prices for flue-cured exceeded the corresponding 1950 prices by 12%.

Outlook

Based on preliminary estimates, the North Temperate Zone's tobacco production during 1951 is forecast at 5,510 million lb., or about 5% above the 1950 production of about 5,230 million lb.

The 1951 crop forecast is about 9% above the 1949 harvest and 23% above

the pre-war 1935-39 average. The increase in production estimated for the United States accounts for most of the overall increase forecasts for 1951; however, substantially larger crops are also reported for Yugoslavia, Turkey, and Canada. The combined total of all other countries shows a slight decrease from the 1950 level of production. However, this forecast is subject to considerable change since reliable estimates are still unavailable for several large tobacco-producing countries.

As a result of substantially increased production in both the United States and Canada, the North Temperate Zone's 1951 production of flue-cured tobacco, the principal type entering world trade, will be considerably larger than the 1950 output. In the case of oriental or Turkish-type tobacco, another important type entering world trade, it is anticipated that the 1951 crop also will be somewhat larger.

A slight increase in the 1951 light air-cured types, which are grown to some extent in most tobacco-producing countries, is expected primarily as a result of the anticipated increase in the United States. Production of dark types, including cigar leaf, during 1951 will probably fall below the 1950 level.

North America.—Canada's 1951 tobacco crop is estimated at 141 million lb., or 20% above the 1950 output. This is primarily a result of increased acreage planted to tobacco, mostly to flue-cured type leaf, in Ontario. The indicated 1951 crop is less than 1% above the 1949 record crop, but is 84% above the 1935-39 average of about 77 million lb.

The United States crop of all types was forecast on August 1 at 2,249 million lb., compared with the 1950 harvest of 2,032 million lb. and the pre-war (1935-39) annual average of 1,460 million lb. Larger production resulted from increased acreage planted to tobacco in 1951. The 1951 indicated production of flue cured leaf of 1,399 million lb. is 11% above the 1950 production of 1,257 million lb. An increase of 16% is forecast for Burley, 6% for fire-cured leaf, 15% for Maryland, and 14% for dark air-cured. A decrease of 11% is forecast for cigar leaf.

Europe. — The 1951 production in Europe, excluding the Soviet Union, is estimated at about 3% above the 1950 harvest. The increase is primarily due to the much larger harvest forecast for Yugoslavia where the 1950 out-turn was greatly reduced due to drought conditions during the growing season. Production forecasts for the other tobacco growing European countries indicate an out-turn about the same as in 1950, with the exception of France for which a 7% decline is indicated. The total 1951 production for Europe is tentatively estimated at 780 million lb. from 880,000 acres, compared with the 1950 production of 755 million lb. from 890,000 acres and the pre war (1935-39) average of 675 million lb. from 680,000 acres.

PRODUCTION AND EXPORT OF LEAF TOBACCO, PRE-WAR, 1949 AND 1950
(*Thousand metric tons*)

Continent	Production (*average*)			Exports (*average*)		
	1934/38	1949/50	1950/51	1934/38	1949	1950
N. and C. America	680	1,070	1,080	225	270	260
S. America	140	160	180	38	40	41
Europe*	335	420	415	129	140	105
Africa	70	120	130	32	64	69
Asia and Oceania†	1,485	1,200	1,300	116	55	56
WORLD TOTAL	2,710	2,970	3,105	540	659	531

*Including Turkey. †Excluding Turkey.

Soviet Union.—Authentic information on tobacco production in the Soviet Union in recent years is not available, but rough estimates indicate an output in 1951 about 3% above 1950, but still about 14% below the pre-war average production of 525 million lb.

Asia.—Reliable estimates of China's 1951 production are unavailable, but fragmentary reports indicate a tobacco crop comparable to the 1950 output and somewhat above 1949, but still well below the large 1948 harvest of 1,593 million lb. Japan's 1951 leaf crop is also estimated about equal to the 1950 harvest but larger than in 1949. Turkey's 1951 crop is forecast at about 210 million lb., or 13% above the 1950 estimate. For other Asia Minor countries, including Iran, Iraq, Syria and Lebanon, which produce a type of tobacco somewhat comparable to Turkish leaf, 1951 harvests are expected to about equal the 1950 output. For all the temperate zone of Asia, 1951 harvests are estimated at 1,840 million lb. from 2,040,000 acres. This compares with 1,835 million lb. from 2,050,000 acres in 1950, about 1,760 million lb. from 1,970,000 acres in 1949 and a pre-war (1935-39) annual average of 1,700 million lb. from 1,675,000 acres.

Africa.—The 1951 production of tobacco in the North Temperate Zone of Africa is estimated to approximately equal the 1950 output. The combined production of Algeria, Morocco, and Tunisia is estimated at 51 million lb. from 60,000 acres. This is comparable to the 1950 output and acreage totals, but substantially above the pre-war average of 40.6 million lb. from 58,000 acres.

In S. Rhodesia there is a continued expansion in the area of flue-cured tobacco for which there is a very strong

Native labour weeding seedling tobacco, Southern Rhodesia

demand from the soft currency countries and the crop in 1951/52 is likely to exceed last year's harvest. For S. Rhodesia, where the yields were exceptionally low in 1950/51, the increase may be substantial. Under the agreement concluded in November, 1950, between S. Rhodesian growers and British manufacturers, the latter undertook to purchase 34,000 tons or two-thirds of the current crop, whichever is the less. With a crop the same size as that of 1950/51 the U.K. would take 27,000 tons, slightly less than in 1950.

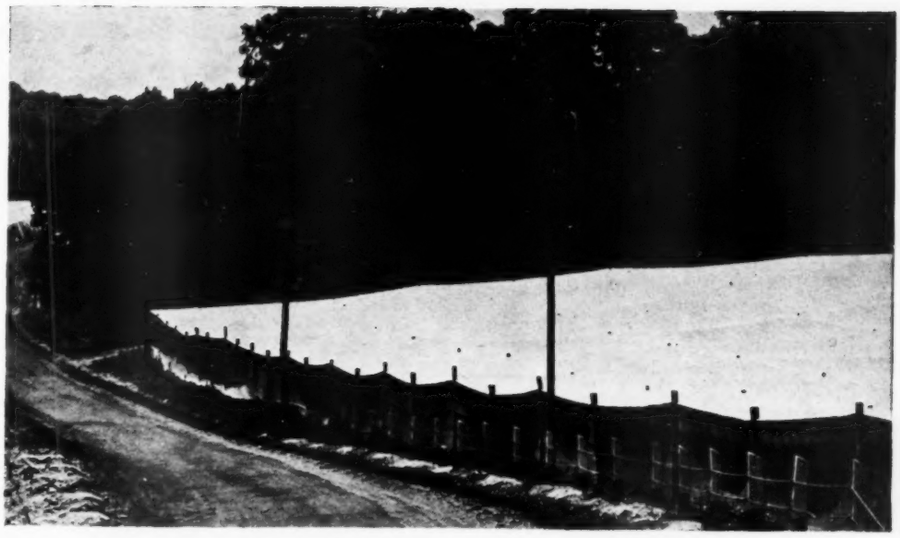
With increased supplies from India the total supplies of flue-cured tobacco in the soft-currency areas in 1951 should not fall below the 1950 level. Last year's experience does not indicate any change in the European attempt to find substitutes for hard currency tobacco wherever possible.

Hanging bundles of leaves of Rhodesian tobacco in the barn for curing

The 1951/52 season may bring some improvement in the export possibilities for the Oriental type stocks which have been increasing during the last few years in Turkey and Greece. In the trade agreement recently concluded by these two countries with the Federal Republic of Germany for the years 1951-53, Germany has agreed to take 35,000 tons from each of them in this period, compared with a 1950 import of 6,400 tons from Turkey and 3,000 tons from Greece.

(Compiled from 'The State of Food and Agriculture,' FAO, Rome, 1951, and 'Foreign Crops and Markets'.)

Photos: pp. 29 (top), 30 and 31 (lower), Public Relations Dept., S. Rhodesia; pp. 29 (bottom) and 31 (top), U.S. Information Service.



Shade tobacco, used for cigar wrappers, is grown in the eastern coastal state of Connecticut, U.S.A.

Royal Show, 1952

The 1952 Show of the Royal Agricultural Society of England will be held at Newton Abbot in Devon and will cover about 110 acres, with a similar area for car parks. It is over 60 years since the Royal Show was held in Devonshire, the last visit to the county being in 1890, when it was held at Plymouth.

Many enquiries, particularly from Kenya, have already been received from overseas farmers planning to visit the 1952 Royal Show. At Cambridge this year no less than 1,942 guest badges were distributed to visitors from 37 countries.

For the first time since the foundation of the Royal Agricultural Society of England it has been found necessary to increase the Society's subscription rates.

Since 1838 the minimum annual subscriptions have remained at £5 for Governors and £1 for Members. Now, in view of ever-increasing costs, the Council has reluctantly decided that a general increase in subscriptions is essential. The new rates are: Members, £2 per annum; Governors (elected on or after January 1, 1952), £10 per annum; Life Members, £30; Life Governors, £100.

Membership of the R.A.S.E. carries with it numerous privileges, including reduced fees when exhibiting in the stock and implement sections of the Royal Show, free entry to the Show and use of the Members' Pavilion. In addition, Members can use the services of the Society's consultants in entomology, chemistry, agricultural engineering, forestry, horticulture, and veterinary problems.

COMING EVENTS

Being a list of the principal agricultural shows, exhibitions, etc., in Britain, which are of interest during 1952

Ayrshire Agricultural Show	April 30-May 1	Ayr, Scotland
British Industries Fair	May 5-16	Earls Court and Olympia, London
Chelsea Flower Show	May 21-23	Royal Hospital Grounds, Chelsea
Bath and West and Southern Counties Show	May 28-31	Nottingham
Three Counties Show	June 10-12	Hindlip Park, Worcester
Royal Highland Show	June 17-20	Kelso, Roxburgh, Scotland
Royal Counties Show	June 18-20	Guildford, Surrey
Royal Norfolk Show	June 25-26	Raveningham Park, Loddon, Norfolk
Royal Show	July 1-4	Newton Abbot, Devon
British Food Fair	July 5-19	Olympia, London
Great Yorkshire Show	July 8-10	Harrogate, Yorkshire
Royal Welsh Show	July 23-25	Caernarvon, Wales
Conference of the British Association for the Advancement of Science	Sept. 3-10	Belfast, N. Ireland
Dairy Show	Oct. 21-24	Olympia, London
Smithfield Show and Agricultural Machinery Exhibition	Dec. 8-12	Earls Court, London

RESEARCH DEVELOPMENTS

Insecticides Help Biological Control?

A FRESH point of view has been added to the insecticides controversy. American entomologists now see insecticides as a useful tool for the study of the way in which the various factors operate in the biological control of insect pests, and currently work is being undertaken with DDT and Chlordane to determine pest-predator relations on citrus trees.

Like other insects, predators and parasites are differently affected by various insecticides. An application of an insect poison may not always kill all the predators on treated trees ; very often the poison changes the relative numbers of the various predators available and it may also lead to an enormous increase in the population of a particular beneficial insect. There is practical evidence of this.

Citrus pests

Normally the Citrus Red Mite is held in check by three predators, *Stethorus picipes*, *Conwentzia hageni* and *Chrysopa californica* and following a spray application of DDT the majority of the *Conwentzia* and *Chrysopa* are killed. However, within a few months the population of *Stethorus* has more than doubled itself, due to the absence of other predators and of competition with them for food. *Chrysopa* is tolerant of Chlordane, thus after a treatment with this insecticide *Chrysopa* has been found as the dominant predator on populations of aphids and mites.

The long-tailed citrus mealy bug is naturally controlled by a complex arrangement of predators and parasites. The effect of DDT on this system is of great interest. During six months following a spray application of this poison there was a marked, steady increase in the percentage of mealy bugs parasitised by *Anarhopus syndeyensis*, while the predators had all been destroyed. The explanation of this change appears to be that DDT tolerant *Anarhopus* was not only released from competition with predators for the available food but it also benefited from the DDT susceptibility of a co-parasite, *Tetracnemus*, as well as itself being freed from the attacks of *Lygocerus*, an insect which preys on *Anarhopus*. This example illustrates the complexity of the biological balance between pests and beneficial insects.

Another aspect of this complex relationship is the interference by ants with the activities of parasites. Orchard ants cosset, and to some extent protect Californian Red Scale insects from the attacks of the parasite *Aphytis chrysomphali*, and recent trials with DDT and Chlordane have partially unravelled the tangled skein of relationships here. To destroy the ants, Chlordane dust was applied monthly on 18 occasions to the soil at the base of selected citrus trees ; to remove the effect of the beneficial insects in controlling the Red Scale some of the Chlordane treated trees were also sprayed 12 times at monthly intervals. Following this preliminary treatment, regular counts were made of the scale on these different groups of trees ; on the trees where parasite activity had been suppressed more than 100 times as many scales were found, as were on the ant-free, untreated trees where there was no interference of parasite activity. While on trees having a normal complement of parasites, but which were ant infested as well, there were 10-20 times as many scale as on ant-free trees.

Even when a poison has no direct effect upon a predator it may lead to the death of the greater part of these useful insects. Neotran (DCPM) even at low concentrations is very toxic to Red Spider and their eggs, but this material is relatively ineffective against the *Stethorus-Conwentzia-Chrysopa* predators found on citrus trees. However, the ' too efficient ' acaricide Neotran when applied to natural populations in the orchard kills so many mites that the predators die from starvation.

Insecticide residue

Gauged by the yard-stick of efficiency against insect pests, insecticide residues on foliage have a useful life of four weeks at most. However, when tested against *Vedalia*, a common predator of the Cottony Cushion scale, even two-month old residues of DDT are highly toxic. Field trials show that deposits from wettable powders or emulsions destroy more *Vedalia* than do dusts or spray-dusts and even Parathion may persist for three months on foliage in amounts sufficient to kill some parasites. Although foliage may no longer be toxic to beneficial insects, a normal balance may not be obtained between pest and predator for upwards of three years following the application of an insecticide.[1]

There are a number of consequences arising from the longevity of insecticidal residues. Of great importance is the trap effect, which DDT may have upon *Vedalia*. Thus, in experimental orchards where some trees had been and others had not been treated with DDT, the seasonal increase in numbers of *Vedalia* on the untreated trees did not occur. While there were *Vedalia* on unpoisoned trees, the numbers remained sensibly constant and it is thought that migration to poisoned foliage was continually occurring. These migrants died without reproducing, and so constituted a drain on the *Vedalia* reservoirs which untreated trees represent.

In addition these residues may lead to preferential recolonisation ; thus DDT tolerant *Stethorus* will reappear in an orchard before *Conwentzia*. In the absence of competitors for available prey there will be a rapid rise in *Stethorus* numbers and a consequent sharp reduction in the population of scale affected by this predator. Even after the DDT residues have lost their effectiveness, *Conwentzia* may have difficulty in re-establishing itself in the face of competition from the huge resident population of *Stethorus*.

Effects of fillers

Studies have also shown that the so-called inert bases—for example, talc and cryolite—on which many dusts and wettable powders are formulated, may themselves exert considerable effect upon predator and parasite populations. Thus three applications of cryolite to orange trees cut by half the number of trees on which predatory coccinellid larvae were present. Pyrophyllite, too, after three applications reduced by half the numbers of predators attacking citrus red mite.

ALAN GOODMAN

REFERENCE

1. J. Econ. Ent., 44, p. 372, 1951.

Plans for Resumption of Palestine Potash

Lord Glenconner, Chairman of the Board of Directors of the Palestine Potash Co. Ltd., is to visit Israel for negotiations regarding the resumption of work in the potash plant by the Dead Sea which has been idle since April, 1948. The Company, having failed to raise sufficient capital for an immediate resumption of work, is facing two alternatives; nationalisation or partnership with the Israel Government.

A Ministerial Commission has been appointed by the Israel Government to negotiate with the Potash Company and to make recommendations for a resumption of operations in the plant.

1951 sugar beet crop. This was the third crop after reclamation

Reclaiming the New Forest

DAVID R. BROWNING, N.D.A., N.D.D.

In almost every country there exist large tracts of heath and other marginal land, all of low fertility. Their reclamation for food production is becoming increasingly important and the following is an account of the efforts to reclaim land of this type in the New Forest area of Hampshire, England, and the difficulties encountered in so doing. The author is a member of the National Agricultural Advisory Service in England and has been actively engaged on this work.

LYING in the south-western corner of the county of Hampshire, separated from the English Channel and the Solent by a narrow strip of smallish farms, the New Forest is a unique area dating back to pre-Norman days and changed but little since those days when it was so named.

Unlike its name suggests it is an area of open tracts of heath, gorse and bracken with, here and there, enclosed woodland. Quoting from the New Forest Committee Report of 1947[1] the total area of the Forest, excluding private property, is 64,707 acres of which 39,946 acres are open heath ; little, if any, work of cultivation has been done on this heath land since, at the latest, the days of the Norman conquest.

Where the open heath is sheltered from the prevailing winds and there is sufficient depth of soil, reasonable grazings have developed providing summer feed for cattle and ponies. These areas are known locally as ' lawns '. Generally they are not to be found on the upland areas which run up to 400 odd feet above sea level. These more often comprise the typical heath country which so many visitors to the famous watering place, Bournemouth, pass through *en route*.

Annual rainfall lies in the 27 to 32 in. range, of which two-thirds fall in the six winter months.

Geologically the soils of the New Forest belong to the tertiary group and vary from Bracklesham and Bagshot beds to Barton and Headon beds. There are also extensive areas of plateau gravels and in the valleys some colluvial and alluvial loams. The soil surface is extremely ' patchy ' and it is common experience when ploughing any new area, to pass suddenly from one type of soil into another. Indeed, the clear cut line of demarcation between patches of gorse and bracken in some areas is indication enough of the variable soil underlying.

Livestock and grazing rights

Farms in and around the New Forest often enjoy grazing rights on the open heath. These rights belong to the owner of the farm and may be included in the tenancy of a farm rented. They permit the holder, on payment of a ' marking fee ' to turn cattle and ponies on to any part of the open Forest. ' Pannage ' rights permit the holder to turn pigs (properly rung) on the Forest for a limited period during the acorn and beech mast season. In the Beaulieu district some farms hold sheep grazing rights, but for some reason sheep are not now depastured in the New Forest. Grazing rights are theoretically limited by the laws of ' levancy and couchancy ' which permit the commoner to turn on to the open forest that number of cattle and ponies which he can maintain on his holding during the winter. These laws have to some extent been allowed to lapse and in practice ponies depasture the forest the year through and quite a number of dry cattle find their living on the forest through all but the coldest winter months.

Control of cattle, land use, etc.

The open heath is Crown land and the Crown is represented locally by the Forestry Commission, the grazing rights are controlled by the Court of Verderers, an ancient body now partly elected and partly appointed. These Verderers employ agisters who range the forest and keep an eye on grazing animals. They are responsible for the marking of animals for which a fee is collected.

As a beauty spot and a natural historians' haunt the New Forest has few equals and always, against the claims of those who want more and better grazings and more food from the forest, one must weigh the claims of those who say the forest must

remain unspoilt by the hand of man.

When, therefore, under the stress of war-time conditions the County War Agricultural Committee turned its attention to this large area of potential food producing land it became evident that much of the success of the job would depend on the co-operation of the numerous people having interests, real or fancied, in the future of the New Forest. So after many preliminary conferences, enquiries and investigations and some cursory experimental work, agreement was reached and by 1944 a scheme was evolved and put into operation. This was limited to an area of 1,000 acres.

Description of scheme

The word ' enclosure ' is anathema to all connected with the grazing and other semi-public and public rights in the forest but it was evident from the few earlier trials that improvement of grazings to any reasonable extent would not be achieved without enclosure and this meant expense. To pay for this and other initial reclamation charges and the seed for sowing the land down to new grass, it was agreed that enclosure for five years was a minimum necessity and this period would be devoted to the growing of arable crops. In the last but one year of cropping, grass seeds would be sown and during the last year, on and off grazing would be practised to ensure the success of the ley establishment. The enclosing fence would then be removed and the new grass left to the mercy of the stock. The commoners would be involved in no expenditure, they would certainly temporarily lose their grazing rights over the enclosed area but would eventually be rewarded by new leys which would be handed over to them without charge.

The plan was adopted but no one really knew then whether the financial estimate was a reasonable one or whether the resultant grazings would persist under the extraordinary abuse they were likely to get, nor, for that matter, the best types of grasses and clovers to sow for such conditions. These questions could only be answered in the light of experience and experience could only be gained by making a start. At the time, of course, the prospect of extra potatoes, oats, wheat—all were attractive to an England hard pressed for food.

Reclamation practice

A start was made in 1944. In selecting suitable sites the following points had to be considered :

(a) The avoidance as far as possible of thin gravel areas. Here the natural herbage was as good a guide as the auger. Heather was to be avoided like the plague, gorse could be growing on good land, bracken, if profuse, invariably was the indication of the best land.

(b) The siting of areas in districts where they were likely, eventually, to provide grazing for the greatest number of cattle and where, during the controlled grazing period, water would be close at hand for the cattle.

(c) The avoidance of land requiring expenditure on drainage operations since funds were limited.

(d) Rights of way and much used forest tracks could not be closed.

(e) The presence of rare plants, such as marsh gentian, and interference as little as possible with the natural amenities of the countryside, were also given attention.

Treatment in 1944 was limited to approximately 500 acres, in 1946 a further 120 acres were added and the 1,000 acres mark practically reached by further additions in 1948. Individual sites varied from 23 acres to 150 acres in extent in the 1944 treatments and fell as low as 14 acres in the 1948 selection. Small areas were in the main avoided owing to the increase in costs caused by extra transport of equipment and they were only accepted when in fairly close proximity to larger sites.

Method adopted

The land selected was first enclosed by a three-strand barbed wire/oak post fence and the ploughs then set to work. If any burning off was needed this was done before fencing and in later areas the ploughing was also done first and fencing erected after. Some surprising soil variations came to light under the plough and it was found better to wait till all the suitable land in the immediate vicinity was ploughed before fencing it in. In handling gorse land the best technique was eventually found to be that of burning the gorse a year before ploughing, the dead brittle gorse stems broke up under heavy discing, and ploughing was a reasonable proposition, otherwise gorse is notoriously difficult to deal with and defies even a bulldozer.

The first implement was usually the prairie buster plough—an excellent tool where there is sufficient soil depth. Where there was only a light cover of agrostis type grasses and bracken an ordinary plough proved satisfactory. July was the best month to start the job, summer fallowing being necessary to kill out the natural herbage.

Soil tests indicated a serious lime deficiency, a five ton chalk dressing was given after the first ploughing and a further five ton dressing applied before working down the final seed bed for the first crop. Further lime tests some two years later showed increase in the soil pH from around the 4.5 mark up to 6.0—not, it will be noted, neutrality.

Many of the soils showed a low phosphate and potash content ; in the case of the former the availability of the phosphate was lowered by the heavy lime dressings—to counteract this the practice was eventually adopted of applying four cwt. superphosphate per acre for the first crop—in addition to the usual dressings of compound fertilisers.

Arable crops

The foregoing description of the soil will have helped the reader to understand

New ley resulting from mixture No. 6

General view over the New Forest showing natural herbage in the foreground and a new ley (mixture No. 3) in the background

the preference for potatoes as a first crop, but shortage of labour and equipment made it obviously impossible to plant 500 acres of potatoes the first year. Even if there had been no shortage it would not have been a sound plan for other equally obvious reasons to handle such an acreage of potatoes on the first year, while to grow none the next would disconcert the best of organisers, so potatoes, oats and wheat were grown. The latter proved disappointing and as a first crop after reclamation was dropped in later work. Wheat can, however, yield quite satisfactorily in the second and subsequent years.

The first year's work brought its own troubles, and one lesson (perhaps a bitter and, at any rate, a costly one) was that the anxiety to avoid the dry gravels had tended to push the land selectors on to the heavier and ill-drained lands. On some of these, arable crops were a failure and, to avoid heavy drainage costs, one small area was put straight back to grass and two other larger enclosures two years later were sown down without a really successful crop being grown on them. Even these difficulties had their compensating values, for the opportunity was taken to sow a variety of grass mixtures and to observe their reactions under unlimited grazing conditions earlier than would otherwise have been possible. These wet lands were, before sowing down, ploughed in narrow 'stetches' to help get the water off them, and the resultant ley has benefited enormously from this old-time practice.

Apart from these difficult areas, arable crops have been on the whole successful and in some cases outstanding. One area, for instance, yielded 18 sacks (27 cwt.) per acre in 1948—its final cropping year. In the same year two fields of Atle wheat threshed out at 22½ cwt. per acre. In 1949 an area near Burley weighed off 23 cwt. per acre of Star oats and last year 10 tons per acre of main-crop potatoes were lifted off the same field. Second early potatoes lifted from a site near Beaulieu have yielded this year (1951) well over 11 tons per acre.

The illustration of the 1951 season's heavy crop of Sharpe's Klein E sugar beet alongside the prolific natural bracken growth (which incidentally hides the surrounding fence) is indication of the potential value of some of this land (illustration No. 1).

Establishment of new leys

Dealing first with types of grasses and clovers sown, mention has already been made of the natural herbage ; associated with the bracken and gorse there are always varying amounts of wild species such as Agrostis sp., *Nardus stricta*, Molinia, a little crested dogstail and Yorkshire fog. Their presence indicated that they were at least able to put up some sort of show against the merciless onslaught of large numbers of cattle and ponies for 365 days and nights in every year.

It was argued that the thing to do, obviously, was to sow some of these natural grasses in the new leys. Another school of thought averred that these grasses would creep in and assert themselves in any event and you need not sow them. The trial plot put down in 1945 was not, by 1948, conclusive and when in that year under-sowing of the cereal crops sown as the last crop of the rotation on the 1944 areas had to be done, a decision had to be taken.

The result was a compromise—most areas were sown to Aberystwyth-type grasses and clovers as simple mixtures, but two of the larger fields had crested dogstail included. A number of different mixtures were used, the object being to ensure a fairly even 'flow' of grass throughout the grazing season for at least the control period before fence removal. Typical mixtures sown per acre were :

1.
14 lb. S.23 Perennial Ryegrass.
2 lb. S.48 Timothy.
3 lb. S.100 Clover.

2.
7 lb. S.101 Perennial Ryegrass.
7 lb. S.23 Perennial Ryegrass.
3 lb. S.143 Cocksfoot.
3 lb. S.100 Clover.

3.
7 lb. S.143 Cocksfoot.
7 lb. S.26 Cocksfoot.
3 lb. S.100 Clover.
3 lb. S.123 Clover.

4.
14 lb. S.48 Timothy.
2 lb. S.100 Clover.
2 lb. S.123 Clover.

5.
10 lb. S.23 Ryegrass.
2 lb. S.26 Cocksfoot.
2 lb. S.48 Timothy.
3 lb. Crested Dogstail.
2 lb. S.50 Timothy.
2 lb. S.100 Clover.
2 lb. S.123 Clover.

6.
10 lb. S.23 Ryegrass.
6 lb. S.101 Ryegrass.
2 lb. Meadow Fescue (Danish).
2 lb. Crested Dogstail.
3 lb. S.100 Clover.
1 lb. Alsyke.

With the exception of mixtures 5 and 6, sowings all took place under a cover crop in the early months of 1948. Grazing control was exercised, after the removal of the nurse crop, during the 1948-49 winter and the summer of 1949 until the fences were removed in the autumn of 1949.

Subsequent reactions

It has been possible to observe fairly closely the reactions of the various grasses to the subsequent mis-management from which they suffered.

No. 3 mixture, for instance, grew rapidly in the autumn of 1948 after the linseed crop was harvested and was grazed quite hard before the winter set in. There was a fairly high proportion of S.123 red clover in the sward, but this has now largely given way to the S.100 clover which has revelled in the close grazing. This ley undoubtedly proved the most palatable

New ley resulting from mixture No. 5 sown direct in the spring of 1949; surrounding fence removed October 1949. This photo, taken July 1951, shows small amounts of bracken appearing

and stock have refused to leave it summer or winter. On the other hand, there have been periods when No. 2 mixture has appeared to be unpalatable and the ryegrasses have been allowed to run up seed heads.

No. 5 mixture was due to be sown under the 1948 wheat crop, but the prolific growth of the nurse crop led to a decision to defer sowing and instead the seed was drilled direct in the spring of 1949. The ley developed well, but has suffered from the fact that the surrounding fence had, according to the terms of the agreement, to be removed in October of that year—only five months after sowing. The result is a rather bare sward but one which is filling out now—the crested dogstail and S.50 Timothy certainly standing up well under the strain.

No. 6 mixture was used on the sites sown down in 1950, the enclosing fences of which are shortly to be removed. The illustration shows the high quality of the ley.

To date all seeds have been sown with a corn drill in two directions, except one small experimental plot broadcast. There are strong indications that, given a good seedbed, broadcasting is likely to result in a more closely knit turf.

The earlier argument that the sowing of natural species of grasses was not necessary and that they would appear of their own accord, is now open to some doubt in the light of experience. Although the new leys have produced enormous quantities of feed they are showing signs of strain—how much longer they will persist remains to be seen ; this performance under what is accepted in English farming as bad grassland management is surprising even such experts as Sir George Stapledon. A pound or two of New Zealand brown top, of crested dogstail or even Yorkshire fog together with half a pound of Wild White clover will probably give a longer lasting if poorer quality result.

Ryegrasses, too, with their tendency to drop a few seeds may also be inclined to regenerate themselves.

Future work

The question may well be asked as to what is intended for the future in the New Forest. If the land has such potentialities, if the new leys are so good, it is surely common sense to do more. The answer is not quite so simple—the existing rights of the Commoners must not be forgotten, the limited area suitable for arable cultivation and its scattered nature will reduce the economic possibilities. It must also be remembered that under wartime conditions, the County Agricultural Executive Committee carried a complete stock of suitable equipment which would be used *inter alia* for the purpose. In future, the necessary capital for such equipment would have to be found. Present temporary depots must be given up and if the work goes on, be replaced by new permanent buildings—a further capital charge. As a scheme arising out of the exigencies of war it has served to demonstrate the relative potentialities of this type of land, of which there must be vast areas throughout the world. To a private individual undertaking such work under similar conditions, an added attraction would be the cash returns he could expect from the grass established after arable crops—a cash return denied the organisers of the work in the New Forest.

It is worth remembering, too, that even poorer tracts of land than those treated in this New Forest work could be made to yield much more grazing by reseeding after a preliminary cultivation and the sowing of a pioneer crop such as rape and ryegrass. Such work can, of course, generally only be undertaken by the persons to whom the ultimate improved grass will yield a return against the expense incurred.

Ecologically, the work done provides an immense field for study. The manner in which the grazing animals roam from one area to another is of great interest and the effect of the new grazings on the whole of the Forest is a matter for speculation.

Some of the land reseeded in 1948 is already reverting to some extent to its former condition but the clover sown on the improved areas is also spreading out on to the natural areas. By how much is the work done going to improve surrounding country ? The answer to this question must depend on the relative areas of treated and untreated land. It would certainly need more than 1,000 acres ($2\frac{1}{2}\%$) to be reclaimed to have any appreciable effect on the fertility and productivity of the whole of the New Forest grazings.

Given an unrestricted choice are the animals likely eventually to refuse the coarse natural grasses and other roughage in favour of the young luscious leys to the ultimate detriment of the leys through over grazing, and indeed to the ultimate detriment of the whole Forest ? For one important prerequisite to the prevention of deterioration in the whole Forest is thorough grazing of the natural herbage. This is again an important question, but it is of interest to note that where numbers of animals have been turned in to large new areas of high clover content leys, practically no cases of bloat have occurred. They were expected but did not occur—presumably because of the animals liking for the natural roughage to which they help themselves at all times.

(*Concluded at the foot of the next column*)

The Amos Memorial Lecture

'DEVELOPMENT in Fruit Growing at Home and Abroad' was the title of the fourth Amos Memorial Lecture, delivered by Mr. Thomas Neame, M.A., at East Malling Research Station recently. A large audience of nearly 400 gathered to hear Mr. Neame, and the Chair for the Lecture was taken by Sir Ronald Hatton, who retired from the Directorship of the Station three years ago.

The speaker, recently returned from a round-the-world tour of East and South Africa, Australia, New Zealand, Canada, and U.S.A., combined his impressions of the tour with his recollections of the changes in fruit growing at home during the last 30 or so years.

Dealing first with control of pests and diseases, he pointed out that after World War I, lead arsenate spraying was the only common insecticide used and for scab there was generally one pre-blossom and one post-blossom application of Bordeaux Mixture, then in 1926 sawfly became a menace ; capsids arrived in 1929 and red spider in the early '30s.

In 1924 a 7-h.p. spraying machine with twin nozzles was used on his family orchard but with the building up of organised spraying programmes machine output was increased, and today, particularly in the U.S.A., automatic machines are widely used. Similarly in British Columbia, a small low-volume air-blast machine delivering only to one side of the machine is commonly used. Research on L.V. high concentration sprays is particularly prominent in Canada and the U.S.A. with evident success. The optimum droplet size, however, has still to be found and is the subject of research in this country.

The many new compounds being tested today are tending to displace the lead arsenate and tar oil washes although it seems that more chemicals are required today than ever before. 'Is it,' Mr. Neame queried, 'a question of the survival of the fittest? Perhaps we need now to use alternative spraying programmes.'

Turning to the question of rootstocks, the speaker said that the world is being scoured for better stocks of stone fruits and pears. He was glad to say that the East Malling stocks were known and respected in many parts of the world.

Regarding varieties, he deplored the fact that appearance of fruit seems to be more important to the public than eating quality. Bramley Seedling is still a popular apple, also Worcester Pearmain and Beauty of Bath ; Conference and Laxton's Superb pears are still popular and Williams (Bartlett in U.S.A.) are coming into favour again.

Few changes in variety popularity of cherries have been made. In New Zealand, incidentally, cherries were seen growing in cages, one acre yielding about 2,000 10-lb. boxes. Pershore plums were still popular. The outlook for soft fruits was more cheerful now that we know more about virus diseases.

On cultivations it was mentioned that since World War I there had been a development towards a permanent sod for orchards. However, clean cultivation is widely practised in the Dominions, notwithstanding damage caused by erosion in certain areas which is now becoming apparent. A great deal depends on irrigation in some regions (*e.g.*, the Mallee Scrub in the Murray River area of Australia) and the speaker felt that irrigation might also benefit fruit orchards in England. Mixed orchards were not now so practicable as a generation ago, principally because of complicated spraying programmes.

Great advances have been made in harvesting, storing and marketing fruit. Gas storage is not much used overseas and cold storage is still the chief method.

It was considered important to encourage co-operative packhouses in this country with the resulting improved standardisation, cheaper transport and easier selling. This had seemed to be the experience of the season.

Mr. Neame closed his lecture by referring to Jesse Amos' knowledge and understanding of plants and stressed the need for growers likewise to get to know their trees and to supply the right environment and treatments to keep them in a healthy growing condition.

(*An account of the Open Day at East Malling which preceded the lecture, is given overleaf.*)

Sir Ronald Hatton (*left*) talking to Mr. Neame before the latter delivered the fourth Amos Memorial Lecture

---

Reclaiming the New Forest

Conclusions

From the work done so far in the New Forest the following conclusions may be drawn :

(a) Reclaiming such land in similar latitudes, heights above sea level and on similar geological strata is a relatively easy process demanding only assured supplies of lime, fertilisers and good management.

(b) Reseeding such land in the presence of grazing animals without restricting their access during the process is likely to result in failure.

(c) Improvement is not likely to be permanent unless continued grazing control can be exercised and supplemented with additional fertilisers and lime.

(d) The choice of grasses for use under such conditions is a wide one, but in the absence of reasonable management after sowing, indigenous grasses will show a longer period of improvement though a lower quality grazing.

(e) Selected improved areas within a larger unimproved area are likely to result in a raising of the general level of fertility and productivity of the whole area provided the improved area is a significant proportion of the whole.

REFERENCE

1. Report of the New Forest Committee 1947. H.M. Stationery Office, 3s. 6d.

Mechanising Nursery Work

THE mechanisation of nursery work would, at first sight, appear to be somewhat limited, bearing in mind the necessarily slow cycle of events in such work. At a Member's Day held at East Malling Research Station recently, however, a certain amount of equipment developed at the Station for mechanising nursery work was demonstrated. All the equipment seen was, to a greater or lesser extent, home-made and no claim was made that perfection had been reached.

For instance, the Malling tree-lifting plough was demonstrated, drawn by a tracklayer and lifting two-year-old plum trees. The plough is a development of a horse-drawn German implement and carries an adjustable share for controlling depth; also a stabilising plate for counteracting crabbing by the plough. This machine was seen to work reasonably effectively even on rather heavy wet soil, the uprooted young trees showing little signs of damage. The machine loosens and lifts trees so rapidly that 20 workers are required to keep it going. The limiting factor in spade lifting is the speed of the manual operation, but with machine lifting all the workers, except the tractor driver, are turned on to shaking out the trees, grading, bundling and labelling. Thus a given number of workers can handle more material and in a shorter time than by the old hand-lifting method. Even in the small nurseries, with insufficient workers to keep the lifter in full work, the use of such a machine increases the efficiency of the tree lifting operation.

A similar plough was seen lifting or rather loosening out of their beds, blackcurrant bushes. This was used on rather heavier and stickier soil than where the fruit trees were, and under these conditions the machine seemed to crab fairly easily.

Another prototype demonstrated was a spraying machine, either tractor or horse-drawn, for straddling rows of fruit bushes, young stock, etc. The spray could be delivered through a battery of nozzles on an adjustable horizontal boom at the rear or through two lances, the hoses of which were supported on arms, high enough to pass over the tallest nursery trees. Further improvements are yet to be made to this machine; for instance, it has been suggested that a metal sheeting strip might be fixed beneath the machine at an angle running down from the front to the back end in order to prevent nursery stock from being damaged by the overhead passage of the machine.

(*Top left*) **Spraying machine specially designed for treating fruit trees and bushes.** (*Top right*) **Planting rootstocks with the help of machinery; the discs open up a new furrow, while the metal rim on the right-hand tractor wheel closes the previous furrow.** (*Bottom left*) **Uprooting stocks by plough, thus eliminating much hand-digging.** (*Bottom right*) **The Malling tree-lifting plough lifting two-year-old plum trees**

A simple implement, horse-drawn, which appeared to have considerable labour-saving possibilities was a plough for facilitating rootstock harvesting. As growers will know, rootstocks are propagated in ridges, similar to potatoes, and usually the soil has to be dug away by a hand fork. This specialised plough eliminates much of the digging by shearing the soil of the ridge on either side of the rootstocks. Thus the plough is simply a vertical knife, cutting away the soil which would otherwise have to be dug laboriously by hand.

A method of planting rootstocks with the aid of machinery has been evolved and consists of two large discs clamped together, tractor drawn, which open up a slit for the planting by hand of the young stocks. The right hand rear tractor wheel has a metal rim round its outside edge, and the width of rows is so arranged that as a new slit is being opend up, this wheel presses in the slit of the previous row, which has by then been planted by hand labour. A flat tray mounted behind the tractor seat can be used either for stacking ballast to ensure that the discs penetrate the soil sufficiently deeply or for carrying bundles of rootstocks which can be thrown out at intervals by a worker seated on the platform as the machine passes along the line. One man on the tractor with 12 women can plant 20,000 rootstocks per day.

Winter operations in the nursery are always a race against time. First comes the hectic lifting season, when every customer is clamouring for delivery, secondly there is the rush to get nursery planting finished before the spring. Any machine that can speed these activities will be more than welcome in the nursery.

Planned Development in the Northern Territories of Australia

THE northern territories of Australia contain a vast tropical area some 523,000 acres in extent with a monsoonal climate, dry winter and moderate summer rainfall. This area has long been a problem and until recently there have been no clear ideas as to the most promising line of development. The most optimistic view has been that it has great potentialities and needs only money and the necessary goodwill to develop it ; the contrary opinion was that it is a vast semi-arid wilderness in which sustained development is not possible.

To arrive at a clear idea of its potentialities, in 1946 the Premier of Australia, in conjunction with the Prime Ministers of Queensland and Western Australia, appointed a North Australia Development Committee. This body invited the Commonwealth Council of Scientific and Industrial Research (C.C.S.I.R.O.) to undertake a factual survey of the territory as a basis for further action ; the report of the survey party appointed is the basis of the present activities. A general development programme for the Katherine-Darwin region was recommended and the Katherine-Daly river basin was selected for first attention, since it contained a large area of flat and reasonably promising land. The survey party also proposed the establishment of an experiment station on the banks of the Katherine River, 200 miles south of Darwin.

An army vegetable farm, which had been closed down after the end of the last war, was available as a site.

This cotton was grown on dry land (non-irrigated) and did well

Establishment

The project was launched in 1946 under the charge of Mr. W. Arndt, B.Sc., but in the first two years little progress was made owing to staffing difficulties. These were, however, overcome and the station now has a staff of four technical officers with the necessary clerical and subordinate assistance. The organisation includes a central station on the comparatively rich river silt of the Katherine River and two subsidiary stations on the dry inland soils.

The main object of the station is to investigate crop production under natural rainfall conditions. At present the only cash crop grown commercially is groundnuts, which are grown on the alluvial soils of the river bank.

Most of the farms are too small, there is no manuring and no rotation is practised.

Work in progress

The main work of the station is concerned with testing possible crops and rotations, principally groundnuts, sorghums, sunflowers, cotton and pasture grasses. Tobacco is also under trial and high yields of air-cured leaf have been obtained. The work is being extended to test the possibilities of flue-cured tobacco. It is considered that tobacco could usefully be substituted for groundnuts on the river banks, since the smaller areas required might enable greater production of truck crops and increase the returns from cultivation.

The red limestone soils away from the river are considered the chief problem ; these soils are deficient in phosphate, while the nitrogen status is also low. The need, therefore, is to devise rotations, including leguminous crops and the introduction of phosphatic manuring.

Pasture investigations are also important. The three main aspects are :

(1) Introduction of leys in a rotation as part of a mixed farming system.

(2) Improvement of natural pasture by fencing, the use of manures, etc.

(3) Improvement of unfenced natural grazings.

Grasses and legumes

Over 200 species of grasses have been introduced for trial, of which the following are considered to show promise and have been selected for grazing trials : Birdwood grass (*Cenchrus biflorus*), White Buffel grass (*Cenchrus ciliaris*) and Nigerian blue grass (*Andropogon gavanus*).

A number of legumes are also being tested ; Townsville lucerne (*Stylosanthus sundiaca*) and Stylo (*Stylosanthus gfacilis*) are promising but cannot tolerate low phosphate status. An alternative substitute is butterfly pea (*Clitoria ternata*), which does well under irrigation.

Plots at the C.S.I.R.O. Experimental Station, Katherine, Northern Territory. Of 200 grasses introduced to the station three only have been selected for grazing trials

Mr. Arndt standing between sorghum which was planted at the same time; that on his left received fertiliser

It is, however, considered likely that, owing to the special conditions in the area, it may prove difficult to acclimatise crop varieties from other environments and it may be necessary to undertake special plant-breeding work to produce varieties suited to the local conditions.

Once the initial investigations have progressed sufficiently it is proposed to start work on rice, vegetable and fruit production, dairying and other problems.

(Compiled from information supplied by the Information Bureau of the Australian Government.)

Dried Pea Seed Approval Scheme

With the assistance of the Seed Production Committee of the National Institute of Agricultural Botany, the Home Grown Threshed Peas Joint Committee again operated the Dried Pea Seed Approval Scheme during the past season. 240 growers' crops were field-inspected totalling nearly 5,300 acres, and forms of 'Declaration of Approval' were issued for 176 crops graded as Field Approved Stock Seed, and 8 graded as Field Approved Foundation Seed.

Special distinguishing sack labels will be supplied to the firms handling the produce of the crops, printed according to variety, name and grade awarded.

The full Report on the Scheme may be obtained on application to the Committee at 4 Westgate, Peterborough.

Methane from Manure as Tractor Fuel

Not Promising on a Small Farm Scale

A PAPER recently read at an open meeting of the Institute of British Agricultural Engineers, by Gerhard Rosenberg, A.R.I.B.A., A.M.P.T.I., entitled 'Methane Production from Farm Wastes as a Tractor Fuel' provided a number of interesting points.

The lecturer described examples of recovering methane from farm waste (animal excreta, waste vegetation, etc.). Under anaerobic conditions, bacteria decomposes organic carbon compounds into methane and carbon dioxide, plus smaller amounts of hydrogen, carbon monoxide, nitrogen, oxygen and sulphuretted hydrogen. He mentioned that 2 gal. of this mixed gas compressed at 5,000 lb./sq. in. into 1/500 of its volume is equivalent to 1 gal. petrol. After washing out the CO_2 it is possible to obtain gas of which $1\frac{1}{3}$ gal. compressed to 5,000 lb./sq. in. is equal to 1 gal. petrol, although this figure was disputed in the course of the discussion and the ratio of 7:1 was suggested as being more correct.

Today, a number of sewage farms in the U.K. and abroad obtain power from waste sludge. The first large plant was built by sewage engineers in the Ruhr soon after World War I. In Germany, after the collapse in 1945, interest was shown in the construction of agricultural gas production plants. One such plant was put up in 1947. Grain crops, waste vegetables, waste potato haulms, chaffed straw, solid and liquid manure are used and thrown into a mixing tank provided with a pump which can suck and stir the waste material, transforming it into a pumpable slurry. This sludge is moved into a fermentation silo which is filled to overflowing so that the more liquid part of the sludge runs back into the liquid tank, is mixed with more waste material and then pumped back into the fermentation silo. Thus a circulation is set up of continually enriched slurry.

This sludge is generally heated by circulating it through a hot water cylinder by means of an indirect coil so that bacterial fermentation may be started.

In order to prevent surface scum from consolidating, a jet pump on the silo sucks the liquid slurry from the bottom and squirts it through a powerful jet at the top.

The gas is piped off the top of the fermenting mass; after two or three weeks, gas production drops off due to accumulation of so much dry matter in the fermentation silo and the whole contents are then pumped into a fertiliser storage silo and distributed by liquid manure carts.

The speaker mentioned that a satisfactory output would be between 0.8 to 0.9 cu. ft. of gas per cu. ft. of silo. He said that between 8 and 20 livestock units would be required to keep a 25 h.p. tractor going for a year. In the German plant the uncompressed gas was stated to be equivalent to 1 gal. of petrol for every 186 cu. ft. of gas.

Examples were given of manure and methane production in various experiments in Germany; Herr Hesserick, one of the pioneers of this work, was quoted as considering that much has still to be done before the practical problems are overcome. It might be possible to reduce the size of the silos and storage tanks by speeding up the artificial digesting processes. Also, if the gas did not have to be compressed to such a high pressure in order to obtain liquefaction, a good proportion of the costs would be eliminated.

Opening the discussion, Mr. H. A. S. Gothard mentioned that anaerobic fermentation of sewage has been used for many years to produce gas. The possibilities of methane on British farms were limited, mainly because of their small size, but he suggested that it might prove useful in the event of an emergency.

Mr. H. M. Macrill, City Engineer for Worcester, told the audience that between 60,000 to 70,000 cu. ft. of methane gas have been produced daily for the last 15 years from the city's sewage (population 62,000), which is roughly equal to $1\frac{1}{4}$ million units of electricity per year, worth between £3,000 and £4,000. Both a gas engine and a 150 B.H.P. diesel engine are used to generate power, the latter requiring 15% fuel and the rest methane. Similarly, it was mentioned that in the Borough of Croydon a large fleet of heavy vehicles is run on compressed methane gas at an approximate cost of 1s. per gal. of petrol equivalent.

The possibilities of running tractors on the gas, however, were not on the whole considered very promising. For instance, the size of the cylinders, which would need to be carried on the tractor, would be a serious obstacle.

Visit to Holland

The National Gardens Guild is now making arrangements for its fourth post-war visit (May 5 to May 14, 1952, inclusive).

Besides enjoying Holland's floral beauty, many interesting towns and places will be visited, including Arnhem and the battlefields. Further details will be sent on application to the Secretary, The National Gardens Guild, 152 Edgwarebury Lane, Edgware.

WORLD CROP REPORTS

WORLD

Sugar beet production down. World production of sugar beet in 1951 is tentatively indicated at 98.7 million short tons, about 5% less than the 1950 harvest of 103.4 million tons and 120% of the pre-war (1935-39) average of 82 million tons. Although the acreage planted to sugar beet this season has increased approximately 2%, crop conditions in Europe promise to affect adversely world beet production as much as the reduced acreage of North America.

Acreage available for harvest in Canada and the United States has been reduced this season by about 21% below 1950. Sugar beet production in these two areas is expected to drop 22% below the previous season.

Production of sugar beet in Europe (excluding the Soviet Union) is indicated at 67.2 million tons compared with 70.1 million tons in 1950. The acreage available for harvest is expected to total 6.1 million acres or 5% higher than 1950. However, for most European countries, the cool, rainy spring and summer and the factor of disease (virus yellow and *cercospora heticole*) indicate a lower yield with a consequent decrease of total production.

The acreage available in the Soviet Union may be 3% higher during 1951 than that of 1950. With favourable crop conditions, it is expected that Soviet sugar beet production will be about 8% above last year's production.

Although Turkey and Iran have larger acreages of beet for harvest, lower yields and resultant lower sugar production are expected this season compared with 1950.

AUSTRALIA AND NEW GUINEA

Increasing rice cultivation. The rice harvest in New Guinea has been completed. So far, the growing of rice in the territory is mostly on an experimental basis, but plans are in hand for growing it on a large-scale commercial basis. The crop from the experimental farm this season yielded 21 bushels to the acre. Other rice plantings were made by village groups, but no details are known of the total acreage or yield.

Meanwhile, in Australia, the growing of rice as a commercial crop is being expanded on a big scale. The 1950 crop in New South Wales yielded 3,750,000 bushels, an average of 100 bushels to the acre, but since then rice-growing has extended to the Murray Valley of Victoria and experimental plantings have been made in Queensland and the northern territory. An area of 600 square miles just south of Darwin has been found suitable for rice growing. The rice-growing regions of New South Wales are now regarded as the most prosperous in the country and this has contributed vastly to the extension of rice acreage. Aircraft were used for the first time this season to sow rice in New South Wales.

Victoria's wheat estimate. The State Superintendent of the Australian Wheat Board, Mr. Beer, believes that nearly 50,000,000 bushels of wheat will be harvested in Victoria this season. The record year was 1915-16, when 58,000,000 bushels were harvested, and the best post-war year was 1949, with 57,000,000 bushels. However, only 2,600,000 acres were sown this year, 2,000,000 less than 20 years ago.

INDIA

1950-51 crop production. The major food grains in India, with the exception of wheat, registered declines in production, while cash crops such as cotton and jute were larger during the 1950-51 season ended in June than in the previous year, according to figures released by the Ministry of Food and Agriculture.

The production of **rice,** the most extensively grown crop in India, was 20,238,000 tons, compared with 21,913,000 the previous year—a decline of 11.5%. Over 75,000,000 acres of land are under rice cultivation, mainly in the wetter parts of the country—West Bengal, Bihar and Orissa.

Among the other food grains showing declines were **millet** and **maize,** with **jowar** (millet) down 10.5% at 5,223,000 tons against 5,760,000, **Bajra** (millet) down 12% at 2,336,000 against 2,554,000 tons and **maize** 1,682,000 tons against 1,959,000 tons.

On the other hand, **wheat** production rose slightly to 6,496,000 tons from 6,110,000 last year, and **sugar cane** to 5,462,000 tons of raw sugar from 4,904,000 tons. **Pulses,** which together with millets constitute one of the most important groups of crops in the country—the food of the poorer classes and fodder for cattle—rose slightly to 3,765,000 tons.

Jute and **cotton,** India's chief commercial crops, have been in short supply since the partition of the sub-continent in 1947, but both these crops show an increase. In the 1950-51 season, 2,926,000 bales of raw cotton (392 lb. each) were produced from 13,859,000 acres, compared with 2,165,000 bales from 11,793,000 acres the previous year.

Jute production increased by 6.6% to 3,292,000 bales of 400 lb. against 3,117,000 bales the previous season. The area under cultivation, mainly in West Bengal and other provinces in the eastern zone, Bihar, Assam and Orissa, showed an increase of nearly 25% in 1950-51. The area now under jute cultivation is 1,449,000 acres against 1,158,000 a year ago.

Coffee production in India has almost doubled during the last ten years, and the area under crop records an increase of more than 50%, according to figures available at the Coffee Marketing Office in Coimbatore (Madras).

The quantity produced in 1949-50 was 525,000 cwt. as against a turnover of 275,000 cwt. a decade ago. The 1949-50 production could well be described as record, since the inception of the coffee industry in India more than a quarter of a century ago.

The area under plantation has risen from 170,000 acres to 226,000 acres. The number of registered estates has also risen more than 23 times from 1,146 to 24,148.

Out of the 1949-50 production, about 80,000 cwt. valued at Rs.17.5 million were exported to countries like Italy, Holland and Belgium where the demand for Indian coffee is great. Other countries which imported Indian coffee were the United States, United Kingdom, Finland, Switzerland, Egypt and some Middle East countries.

DENMARK

1951 sugar beet. The Danish crop is now expected to be only slightly below the 1950 yield of 335,000 tons, due to exceptionally fine weather in October which prolonged the growing period. It was earlier feared that the crop would yield only 300,000 tons.

Of the 1950 crop, the domestic market (including the industries manufacturing sugar products for export) absorbed 210,000 tons, leaving 125,000 tons for export. From the 1951 harvest the export industry is to receive a further 10,000 tons, mainly as a result of large exports of fondants to Britain. In the first nine months of 1951 32,000,000 kroner worth of this product was sent to the U.K.

At least 100,000 tons of sugar are expected to become available for export from the 1951 production. However, Norway has already booked 35,000 tons, Western Germany 6,000, Finland 5,000 and Sweden 15,000 tons.

ARGENTINA

Pessimistic crop prospects. Deep concern was being expressed in Buenos Aires at the decline in Argentine agricultural exports and the gloomy crop outlook. The official crop report for September mentioned serious damage caused by prolonged drought over large areas of the country. Livestock, dairy herds and crops were affected, it said. Private estimates indicate that, in many districts, sowings for the 1951-52 crop year were below the areas harvested during 1950-51. The official Argentine crop report for October stated that rains in Buenos Aires, Santa Fe and Entrerios were insufficient to break the drought. As a result, a major portion of the wheat crop was lost in Cordoba, Pampa, northern Buenos Aires and northern Santa Fe. On the other hand, the linseed crop was favourably affected in the areas of Buenos Aires, Santa Fe and Entrerios. Growing crops were considered good in Buenos Aires and Entrerios, while only fair in Cordoba and southern Santa Fe.

Grain trade circles point out that wheat and maize stocks in the Argentine on July 1 were respectively 37 and 49% below the average for the years 1945-49. These figures show how vital the present harvest will be, since current stocks will be inadequate to meet normal market requirements in the event of a poor harvest.

Total wheat stocks on July 1 are stated to have amounted to 2,300,000 tons, from which domestic consumption for the second half of 1951, totalling 1,750,000 tons, must be deducted. This leaves a maximum 550,000 tons for reserves and exports.

Maize stocks on July 1 (including the bulk of the new harvest) amounted to around 2,400,000 tons. With domestic requirements estimated at 2,000,000 tons over the year, the amount for export and reserves would be only 400,000 tons, compared with over 800,000 tons exported in the first ten months of 1950. Furthermore, the drought has impeded maize sowing so that an increase in reserves is needed to guard against a possible crop failure.

The only exceptions to the downward trend in exports are linseed oil, raw cotton, quebracho extract, and canned meat.

In the absence of adequate stocks, the decline in exports cannot be checked, let alone reversed, it is stated. At least one year must elapse before stocks can be replenished and export surpluses established. This depends entirely on an improvement in weather conditions.

WORLD CROPS

OUR NEXT ISSUE will contain Part 1 of an article by Mr. H. A. Curtis, a director of the Tennessee Valley project in the U.S.A., on **rainfall, watershed and streamflow,** based on studies carried out in that area. A method of **soil improvement from town refuse in the Netherlands** is described by John Grindrod, B.A. Part 2 of H. Ferguson's article on **the Gezira of the Anglo-Egyptian Sudan** appears in this issue; also No. 2 of the series **How industry aids agricultural research**—this month the subject will be the **Ford Motor Co.** Besides these, there will be other articles and the usual regular features.

FRANCE

Extraction rate increased. The French authorities have increased the extraction rate for wheat milling from 78 to 80%, according to the Ministry of Agriculture. This is a first step to meet the deficit in the 1951 domestic crop which is expected to yield about 7,000,000 metric tons compared with 7,700,000 in 1950, while home consumption is forecast at 7,300,000 tons.

Despite this, the Ministry intends to export 110,000 tons under the International Wheat Agreement. To avoid a shortage, the Government have drafted a programme providing for imports of 400,000 tons of soft wheat for metropolitan France and 400,000 to 450,000 tons for French North Africa and other overseas territories.

In the meantime, the French Wheat Producers' Association has urged the suspension of the Government's import programme for France itself. It claimed that the programme is not justified by the present statistical position of the market and stated that such imports are likely to impose heavy financial charges on the country, detrimental to imports of essential goods.

The Association confirmed its support of France's position as a wheat exporter, but stated that the Government should request the International Wheat Council to apply Article 10 of the International Wheat Agreement if there should be any doubts about adequate wheat supplies from national crops.

Article 10 provides that an exporting country, which is in fear of insufficient crops, may ask to be exempted during the current season.

MEXICO

1951-52 cotton.—The 1951-52 cotton crop in Mexico is currently estimated at 1,270,000 bales (500 lb. gross), or about 13% above the 1,120,000 bales produced in 1950-51. Area planted to cotton during the current season is estimated slightly above 2 million acres, an increase of 7% over the 1,875,000 acres harvested in the previous season.

Prospects for the crop in a part of the Matamoros region are below average due to the lack of rain from May 27 to June 25. During the latter part of this dry period, approximately 10,000 bales of cotton per day were lost because of the lack of moisture. Originally, over a million acres were planted to cotton in this area this year, but adverse weather conditions permitted only about 740,000 acres to survive, somewhat less than the 790,000 acres harvested in 1950-51.

With picking having become general in late July, about a month later than usual, production in 1951-52 is forecast at 280,000 bales, considerably below the 355,000 bales harvested in 1950-51. A total of 26 new gins had been installed in recent months in the area to handle the anticipated increase in production.

Offsetting the poor crop prospects in the Matamoros region in the east is the favourable outlook along the west coast of Mexico in the States of Sonora and Sinaloa, where the largest increase in Mexican cotton acreage has occurred, from 161,000 in 1950-51 to 280,000 in the current season. Conservative production estimates place the crop at about 190,000 bales, compared with 100,000 bales in the previous season. An oil mill and cotton compress are under construction near Guaymas, Sonora.

(*Foreign Crops and Markets.*)

ITALY

1951 production. Italian agricultural production as a whole was lower last year than in 1950. The olive crop amounted to about 13 million quintals which yielded over 3 million quintals of oil, slightly better than in the previous season. The grape crop is estimated at approximately 64 million quintals, 6% over the 1950 level. Wheat production in 1951 amounted to a little over 7,350,000 tons, against 7,624,800 in 1950. Other crops were as follows:—Maize, 26 million quintals (against 19,241,000 in 1950); barley, 2,679,000 quintals (2,909,000); oats, 5,257,000 quintals (5,534,000); seed beans, 4,515,000 quintals (4,865,000); potatoes, 33,417,000 quintals (23,805,000). The flax, hemp, cotton and sugar beet crops promise to be excellent.